IOWA STATE UNIVERSITY

Iowa Soybean Research Center

April 2025 Newsletter

Vol. 25

ISRC Participates in ISU Day at the Iowa State Capitol

The Iowa Soybean Research Center was one of 17 Iowa State University programs featured during ISU Day at the Iowa State Capitol on March 4, 2025. ISU President Wendy Wintersteen led the group of more than 40 faculty, staff and students demonstrating and explaining how Iowa State innovation serves Iowans by contributing to the state's economy, supporting its nation-leading agricultural industry and preparing students for future careers in agriculture.

ISRC staff from left, Communications Specialist Kara Berg, Director Greg Tylka and Research Administrator Jill Cornelis during ISU Day at the capitol.

ISRC staff spoke with legislators, statehouse staff and other visitors about the center, describing the types of research being funded, the collaborative partnerships we are involved with and the educational outreach activities we are engaged in. ISRC faculty research affiliates who were also in attendance with other organizations included Sotirios Archontoulis, Agronomy, with the Iowa Nitrogen Initiative, Matt Darr, Ag and Biosystems Engineering, with the Digital Ag Innovation Lab and Chad Hart, economics, with the Center for Agricultural and Rural Development. Other ISU groups that the ISRC interacts with for campus tours and educational events like SoyFest who attended the event included the ISU Veterinary Diagnostic Laboratory and the ISU Creamery.

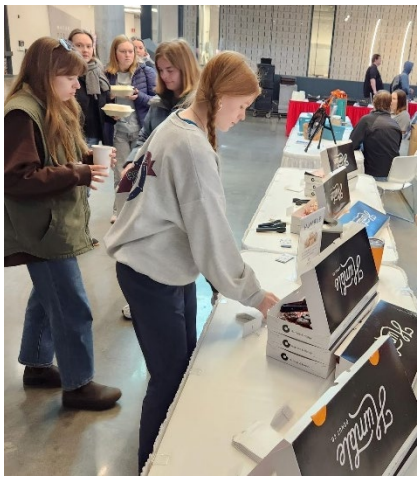
Above left, ISU President Wendy Wintersteen, at far left, speaks with students while visiting the ISRC booth during ISU Day at the state capitol. Above right, 17 ISU programs were represented during ISU Day in the rotunda of the state capitol.

ISRC Hosts Omelet Breakfast in Honor of Soy Foods Month

Above left, Cy interacts with students waiting in line for an omelet during the ISRC's Soy Foods Month breakfast on April 8th at the ISU Student Innovation Center. At right, ISU Dining Services cooks omelets for ISU students.

The ISRC, Iowa Food and Family Project, Iowa Egg Council, North Central Poultry Association and Humble Donut Co. hosted an omelet breakfast for Iowa State students on April 8, 2025 in celebration of Soy Foods Month. The free event was held at ISU's Student Innovation Center. It was organized to educate students about soy and poultry while also providing students with some food and fun. The connection of soybeans to eggs and poultry is that soybean meal is the primary protein supplement used in poultry diets.

This was the second year for the event. Humble Donut Co., which provided donuts made with soy protein, was a new addition to the event. Nearly 200 students enjoyed a tasty omelet, a donut and answered some trivia questions to collect free soybean-related giveaway items. Special thanks to ISU Dining for making the omelets!



Above left, Lydia Zerby and Brock Johnston from Iowa Food & Family Project asked students trivia questions and provided giveaways, including a handy Soy Foods Guide. Center, Humble Donut Co. provided a variety of mini donuts containing soy protein. Above right, Cy and Melissa Alto-Kintigh from the Iowa Egg Council handed out squishy "stress eggs".

ISRC-funded Project on the Effects of Increased CO_2 and Heat Stress on Soybean Performance Reaches Completion

In 2021, the Iowa Soybean Research Center funded a three-year research project to study the effects of increased CO_2 and elevated temperatures on soybean in a climate-controlled facility known as the Enviratron located at Iowa State's Agricultural Engineering and Agronomy (AEA) Research Farm. The project was led by ISU Professors Asheesh "Danny" Singh, agronomy; Lie Tang, agricultural and biosystems engineering; and Steve Whitham, plant pathology, entomology and microbiology.

Above left, soybean root nodules. Above right, ISU researchers Dinakaran Elango and Liza Van der Laan of Danny Singh's Lab study soybean root nodule growth at the Enviratron.

Results from the first phase of the study provided insight into disease development and defense responses of soybean in rising CO_2 levels that, at current emission levels, will be realized within the next 35-45 years. Results were both positive and negative and in one case, the infection by the pathogen was not affected, but a greater loss in biomass was seen. The second phase of the study revealed the effect of heat stress on soybean and in changes to composition of microorganisms in the soil.

To study the effects of increased CO_2 on soybean, soybean plants were grown in either elevated CO_2 or current levels of CO_2 in growth chambers in the Enviratron. The plants were infected with bean pod mottle virus, soybean mosaic virus, *Pseudomonas syringae* pathovar *glycinea* (bacterial blight), *Fusarium virguliforme* (sudden death syndrome, SDS), or *Pythium sylvaticum* (seedling root and stem rot).

Results showed that the plants growing in elevated CO_2 conditions were less susceptible to bacterial blight, more susceptible to the viruses and SDS. The susceptibility to seedling root and stem rot was unchanged. Soybean defenses to bacterial blight were more strongly activated in elevated CO_2, whereas defenses against the viruses appeared to be lowered. Outcomes suggest avenues for additional research to understand why elevated CO_2 affects some diseases and to identify genes that can be used to improve soybean resistance to disease in future climates. Additional work is also needed to understand how elevated CO_2 interacts with temperature and water stresses to affect soybean diseases.

In addition to being supported by ISRC funds, this portion of the project had leveraged funding from the ISU Plant Sciences Institute. Data and results from this project were used in support of a successful USDA NIFA grant application titled "Machine Learning-Assisted Multimodal Chemical, Biological, Physiological Sensing for Assessing Multiplex Plant Stress States."

The second part of the research studied the effects of heat stress on soybeans, focusing on how elevated temperatures influence native soil microbial communities and their role in mitigating heat stress. A multi-omics approach was employed, which included analyzing soil microbial diversity (through bacterial and fungal sequencing), the root metabolome, gene expression, and belowground traits such as nodulation and root anatomical traits to understand how these factors collectively impact crop growth. The results revealed that elevated temperatures disrupted the composition and structure of soil microbial communities.

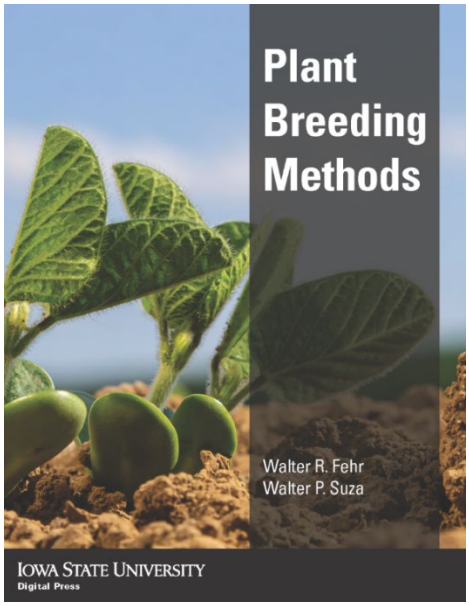
Specific bacteria and fungi were strongly associated with heat stress conditions, revealing a microbial response uniquely adapted to high-temperature environments. Belowground traits, particularly nodulation and root anatomical traits, were highly sensitive to heat stress, with nodulation being significantly impaired. Elevated temperatures altered expression of genes associated with heat stress pathways. Notably, some of

these responses occurred in different soybean cultivars, suggesting common mechanisms of heat adaptation in soybean. Additionally, the soil microbiome was found to play a critical role in modulating these gene expression changes under elevated temperatures. These findings reveal the complex interplay between heat stress, soil microbes, and plant physiological responses, offering valuable insights into the mechanisms of alleviating heat stress in soybeans.

The results reveal opportunities for further research into specific molecular pathways and genes to be used to develop heat tolerant soybeans. Findings also provided evidence that soil microbes contribute to the heat stress response of soybeans and can aid in alleviating the stress. This means soil management practices may possibly be implemented to leverage microbes for improved crop health and productivity.

The final report for this project can be found on the ISRC website. In addition, Whitham was part of a group of researchers who submitted an article to New Phytologist on the elevated CO_2 portion of the project and commentary on the article was recently published in New Phytologist.

Open Source E-books on Plant Breeding and Genetics Available through ISU Digital Press



ISRC faculty affiliate Walter Suza, agronomy, and 25 additional Iowa State University contributing authors created a series of open source, agronomy e-books in plant breeding and genetics. Thanks to ISU Digital Press, a unit of ISU's Parks Library, these resources are now available and free for anyone to use worldwide. ISU Digital Press provides the platform for the e-book modules as an open access publisher.

Suza, George Washington Carver Endowed Chair and Adjunct Associate Professor of Agronomy, served as Project Director for ISU's Plant Breeding E-learning in Africa (PBEA) program from 2013 to 2021. Building on ISU's expertise with online plant breeding education, Suza helped to develop open source, e-modules through PBEA to train African students in the management of crop breeding programs for public, local and international organizations. PBEA collaborated with faculty at universities in Ghana, South Africa and Uganda to use the e-modules as part of their curriculum to support a broader project based in Africa called Improved Master of Science in Cultivar Development for Africa. From 2013 to 2018, 90 MS students were trained in Africa using PBEA resources.

The collaboration to package PBEA e-learning modules into open educational resources (OER) textbooks began in 2021 after Suza received a Miller grant from the ISU Library. Since then, Suza and the ISU Digital Press team have published nine OER textbooks with the goal of sharing valuable knowledge and expanding the reach of the materials to get it into the hands of those who want to read them.

"This collaborative effort is touching lives beyond anything I could have imagined. It has been an honor and a privilege to work alongside dedicated colleagues and partners to advance plant breeding education around the world," said Suza. He even uses the e-books in teaching his Genetics 3200 course: Genetics, Agriculture and Biotechnology at ISU.

Between March 2023 and March 2025, the plant breeding OER textbooks have been accessed by 156,000 users and downloaded 7,500 times worldwide. In the U.S., the OER textbooks have been used by 21,000 users and downloaded 943 times, including 584 users and 106 downloads in Iowa.

The following e-books are available for free download via ISU Digital Press:

Plant Breeding Methods

Genetics, Biotechnology, and Agriculture

Crop Genetics

Molecular Plant Breeding

Crop Improvement

Cultivar Development

Quantitative Methods for Plant Breeding

Quantitative Genetics for Plant Breeding

Principles of Cultivar Development

ISRC faculty affiliates contributing to the e-books include Walter Suza, Madan Bhattacharyya, Ken Moore, Arti Singh and Asheesh "Danny" Singh. *The PBEA e-modules were made possible due to funding received from the Gates Foundation.*

Researcher Spotlight: Silvina Arias

Silvina Arias is an ISRC affiliate and Adjunct Assistant Professor of Plant Pathology, Entomology and Microbiology and is also affiliated with ISU's Seed Science Center. In 2023, the ISRC funded two of her research projects: Gene Expression Characterization of Iron Deficiency and *Fusarium graminearum* Interactive Responses in Soybean, of which a final report will be coming soon and Application of Innovative Intercropping Practices to Increase Soybean Production in Iowa, which will be completed toward the end of 2026.

Above, from left, master's student Natalia Sancho Quiros and Silvina Arias study iron deficiency chlorosis-*Fusarium* gene expression in soybeans using a hydroponic system.

The first project looks at characterizing genes that are differentially regulated by soybean plants when they are infected with the pathogen *F. graminearum* and grown in an iron deficiency environment. Arias expects the research will help develop new ways to broaden the resistance of soybeans to *Fusarium* root rot and iron deficiency. She is collaborating on this research with agronomy research geneticist Jamie O'Rourke.

Above, a field showing soybean relay cropping trials in June 2024. *Drone image taken by agronomy research scientist Fernando Mauri-Marcos.*

The second project aims to expand soybean production and potentially increase the economic returns to Iowa farmers by changing how they use existing cropland. The project is exploring the possibility of intercropping soybeans with winter small grains and oilseeds, such as canola, to take advantage of Iowa's six-month fallow period. Co-investigators on this project include Leonor Leandro, professor of plant pathology, entomology and microbiology, and Mark Licht, associate professor of agronomy.

"I want to acknowledge the support of the Iowa Soybean Research Center in advancing collaborative research projects that drive innovation and progress within the soybean industry.

Their partnership is instrumental in fostering research initiatives that benefit both the industry and soybean farmers, ensuring continued growth and sustainability. We look forward to the impactful contributions that these projects will bring to soybean production and agricultural community of Iowa," said Arias.

Arias joined Iowa State University in 2016 as a post-doctoral research associate and in 2019 she was promoted to adjunct assistant professor of plant pathology, entomology and microbiology. Her research interests include studying interactions among plant pathogens, environmental conditions and host defense responses; plant-microbe associations; detection of seedborne and seed-transmitted pathogens of crop plants; analysis of mycotoxins (toxic substances produced by certain types of fungi that can affect humans and animals) and other secondary metabolites (a diverse group of chemicals that help plants survive stress and defend themselves).

Arias earned her undergraduate and graduate degrees in Biochemistry at the University of Cordoba in Argentina. After working for several years as a food analytical microbiological biochemist in the Center of Excellence on Products and Processes, she returned to the University of Cordoba to pursue a PhD. Her PhD research provided specific biochemical evidence for the phytotoxic (or adverse) effects of fumonisin B1 (toxic mycotoxin that can contaminate food and feed) in tissues of maize seedlings, and the role of this in the ability of *Fusarium verticillioides* to cause seedling disease. *Fusarium verticillioides* is the most commonly reported fungal species infecting maize.

Get to Know IAC Rep: Shane Brockhoff, Meristem

Shane Brockhoff is the Vice President of Sales – Western U.S. for Meristem Crop Performance, LLC, an ISRC industry partner. He serves as a representative on the ISRC's Industry Advisory Council for Meristem. Brockhoff leads seven sales regions for Meristem west of the Mississippi River.

Shane Brockoff, back center, with his family.

Meristem is a global leader in delivering live, in-field biologicals. Meristem is passionate about bringing innovative technology to farmers to help them reach new yield levels while maximizing return on investment and sustainability long-term. Their business strategy is to help farmers grow more bushels for less.

Of his time on the ISRC's Industry Advisory Council, Brockhoff says, "The partnership with ISRC is valuable to Meristem. We enjoy being on the cutting edge and working with world renowned researchers to find new solutions in soybean production for the American farmer."

Brockhoff has a strong background in soil physics, chemistry, and biology – earning his BS and MS degrees in agronomy and crop science from Iowa State University. Prior to working for Meristem, he worked as a Regional Seed Lead for West Central Cooperative, as an Agronomist and Area Business Manager for AgriGold and as a Division Sales Lead for AgReliant Genetics. He and wife Lacey, and their six children, reside near Walnut, Iowa, where they also farm.

ISA & NCSRP Funding Proposal Submission Deadlines

The Iowa Soybean Association (ISA) and the North Central Soybean Research Program (NCSRP) recently released requests for proposals. Below are links to each organization's website and the required application forms.

ISA: https://www.iasoybeans.com/research/request-for-proposal
The due date for submitting proposals to the ISA is 11:59pm central time on May 12, 2025.

NCSRP: https://ncsrp.com
The due date for NCSRP proposal submissions is 5pm central time on May 23, 2025.

GDM Announces Travel Grant Winner for NAPB Meeting

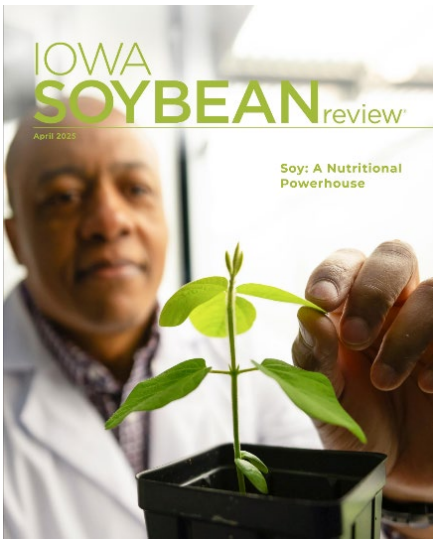
Memis Bilgici

ISRC industry partner GDM is sponsoring a travel grant program for ISU graduate students presenting their research at national scientific conferences in 2025. The grants help cover student travel expenses while also recognizing outstanding student research contributions. The ISRC assists GDM with the application and award/travel reimbursement process.

GDM is excited to announce that Memis Bilgici, a PhD student in plant breeding advised by Professor of Agronomy Thomas Lübberstedt will receive a $1,000 travel grant to attend and present his research at the National Association of Plant Breeders Meeting in Hawaii in May. Bilgici will present a poster at the meeting on results of his research on maize cultivated in perennial ground cover systems.

Thank you to all of the students who applied, and thank you to GDM for supporting the talent and hard work of ISU graduate students!

Suza's Research Featured in Iowa Soybean Review



ISRC faculty affiliate Walter Suza, agronomy, and his ISRC-funded project investigating the role of sterols in soybean growth and development, were featured in the April issue of the Iowa Soybean Association's Iowa Soybean Review. Suza is seeking to identify the genes responsible for making healthier phytosterols and explore their impact on soybeans.

Science for Success Hosts Soybean Webinars

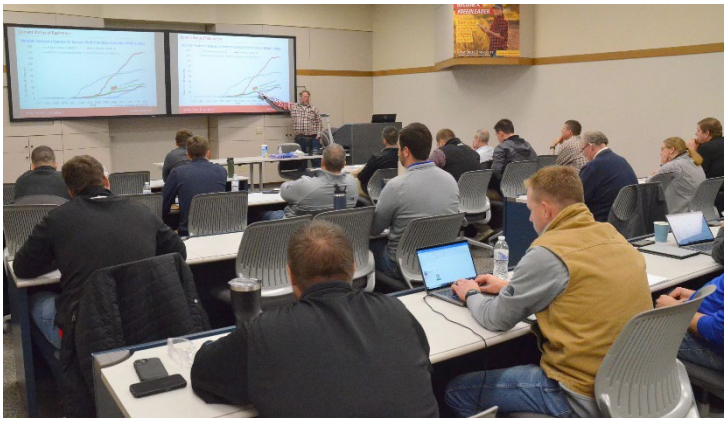
If you missed the recent Science for Success webinars, the recordings are available at the YouTube links below.

February 28: Climate Challenges in Soybean Production

March 14: Economic Insights for Uncertain Times

Science for Success brings together 20+ land grant institutions, including Iowa State University, to collaboratively deliver research-based soybean best management practices into the hands of U.S. farmers. Science for Success is funded by the United Soybean Board through the checkoff program to aid in amplifying access to timely, data-driven best management practices so farmers can better manage agronomic sustainability.

ISRC/ISU Host Syngenta Spring Training Workshop



Weed scientist Wes Everman presents information on herbicide-resistant weed species to a group of agronomists from Syngenta.

In March, the ISRC coordinated a two-day spring agronomy training session for ISRC industry partner Syngenta at ISU's Seed Science Center. ISU Extension specialists provided updates on a variety of crop-related issues. Wes Everman presented a weed science update, Angie Rieck-Hinz provided the latest information on aphids, pyrethroids and corn rootworms and Meaghan Anderson presented on managing residual herbicides with the timing of cover crop termination and on red crown rot in soybeans.

Mallarino Recognized with Iowa Master Farmer Exceptional Service to Agriculture Award

Wallaces Farmer recently recognized retired Iowa State Professor of Agronomy and ISRC affiliate Antonio Mallarino with the 2025 Iowa Master Farmer Exceptional Service to Agriculture Award. Mallarino retired in December of 2023 following a 35-year career at ISU where he served as a soil fertility researcher and Extension specialist.

ISU College of Agriculture and Life Sciences Awards

Three ISRC research affiliates were honored at the College of Agriculture and Life Sciences Spring Awards Program on March 11. Congratulations!


Dior Kelley


Danny Singh


Mike Castellano

Dior Kelley, genetics, development and cell biology - Faculty Early Achievement in Research Award

Asheesh "Danny" Singh, agronomy and associate dean of research and discovery - Faculty Outstanding Achievement in Research Award

Iowa Nitrogen Initiative (led by **Mike Castellano**, agronomy) - Team Award

ISRC Affiliates Receive Professional Recognitions

Agricultural and Biosystems Engineering

- **Thomas Brumm** – Distance Education Teaching Award, College of Agriculture and Life Sciences (CALS); Fellow, American Society of Agricultural and Biological Engineers; Massey-Ferguson Educational Gold Medal Award, American Society of Agricultural and Biological Engineers
- **Matt Darr** – Fellow, National Academy of Inventors
- **Matt Helmers** – ADS/Hancor Soil & Water Award, American Society of Agricultural and Biological Engineers
- **Amy Kaleita** (RegenPGC Team) – Interdisciplinary Team Research Award, ISU
- **Michelle Soupir** – Fellow, American Society of Agricultural and Biological Engineers

Agronomy

- **Susana Goggi** (RegenPGC Team) – Interdisciplinary Team Research Award, ISU
- **Mark Licht** – Editor's Citation for Excellence as a reviewer for Agricultural and Environmental Letters, American Society of Agronomy, Crop Science Society of America and Soil Science Society of America
- **Marshall McDaniel** (RegenPGC Team) – Interdisciplinary Team Research Award, ISU
- **Ken Moore** (RegenPGC Team) – Interdisciplinary Team Research Award, ISU
- **Walter Suza** – Top Agri-Food Pioneer, World Food Prize Foundation
- **Andy VanLoocke** – Mid-Career Achievement in Research Award, CALS; Raymond and Mary Baker Agronomic Excellence Award, Agronomy
- **Kan Wang** – Distinguished Professor, ISU

Statistics

- **Petruta Caragea** – Cassling Family Faculty Award for Outstanding Achievement in Teaching, College of Liberal Arts and Sciences

Upcoming Events

July 23-26: Soy 2025: 19th Biennial Conference on Molecular & Cellular Biology of the Soybean, Madison, WI

August 1: ISRC/Meals from the Heartland Packaging Event at Hansen Agriculture Student Learning Center, Ames, IA

August 27: SoyFest 2025, Iowa State University, Ames, IA

Each Wednesday at Noon - Iowa Learning Farms Webinars

Keep up with what's new at the ISRC on **LinkedIn** and **X** (formerly Twitter).

Special thanks to the Dr. Keith and Virginia Smith Family for providing funding to make this newsletter possible.

IOWA SOYBEAN RESEARCH CENTER

Have a newsletter idea or wish to subscribe? Email us at ISRC@iastate.edu