Complex trade issues and wacky weather conditions in 2018 led to a record breaking year for seed testing in the Iowa State University (ISU) Seed Laboratory at the Seed Science Center (SSC). This is good news for the more than 50 students who gained valuable experience working in the lab, during the past year.

“Some of the top seed industry experts and executives started at the ISU Seed Lab,” said Dr. Manjit Misra, SSC Director. “We provide hands-on experience to future leaders which helps the seed industry through science.”

For students, and the staff and faculty who mentor them, a normal testing year for the lab is around 40,000 lots or close to 23 million seeds. In 2018, the lab saw up to a 20 percent increase, mostly between July and December.

Dr. Misra credits some of the increase to the vast expertise of the lab and says testing often becomes the basis for problem solving research. The lab tests for 350 seed-borne pathogens, for almost any seed from flowers to vegetables to tree seed.

“We are helping customers solve problems with seeds,” said Misra. “We do tests nobody else will do. This scientific expertise is part of the reason we are seeing an increase.”

Corn is the most commonly tested seed in the lab, followed by vegetables such as tomato, pepper, and cucurbits (cucumber, melon, watermelon, squash, pumpkin).

“The majority of samples come from seed companies that need a phytosanitary certificate to export seed,” said Dr. Charlie Block, SSC Seed Health Coordinator. “We test for plant pathogens such fungi, bacteria, viruses, viroids and nematodes and provide lab reports that are used to apply for the certificate.”

The lab also helps identify issues related to seed quality. Block says

“We are helping customers solve problems. We do tests nobody else will do. This scientific expertise is part of the reason we are seeing an increase.”

~Dr. Manjit Misra
SSC Director
An Iowa State University Seed Science Center (ISU-SSC) professor will spend February 10 through March 15 at the National University of Northwest Buenos Aires in Pergamino, Argentina, working on soybean disease research. Dr. Gary Munkvold, a professor of Plant Pathology and Microbiology at ISU-SSC, was chosen as a Fulbright Specialist, a program operated by the U.S. Department of State.

“Many of the same diseases are important in both countries, although we don’t know how much diversity is in the pathogen populations in Argentina versus the U.S.,” said Dr. Munkvold. “I’ll also be giving presentations at the university and at soybean disease workshops in several locations around central Argentina.”

The specialist program’s objective is to pair U.S. academics and professionals with international host institutions to share expertise, strengthen institutional linkages, learn new skills, and learn about other cultures while building capacity at the overseas host institutions.

As a designated Fulbright Specialist, Munkvold could also be assigned to other projects in the future, leading to even better international collaboration and learning opportunities for the ISU-SSC.
There may be a scramble to find good quality soybean seed for planting in 2019. This comes after much of the soybean crop in the United States was plagued by unusually wet weather before the crop could be harvested in 2018.

“The soybeans sat in the field too long due to rain and muddy conditions,” said Dr. Charlie Block, Iowa State University Seed Science Center (SSC) Seed Health Coordinator. “The combination of rain and delayed harvest was favorable to fungal infection.”

Block, a former USDA Plant Pathologist and ISU Plant Pathology and Microbiology Assistant Professor has nearly 40 years of experience working with seed-borne pathogens. He says the seed quality from the 2018 soybean harvest is considerably lower than what is seen most years. High levels of fungal seed infection and resulting poor germination are common. The main disease seems to be Diaporthe pod and stem blight, but the SSC Seed Laboratory has also seen high levels of Fusarium-infected seeds as well as discolored seeds due to frogeye leaf spot (Cercospora sojina) and purple seed stain (Cercospora kikuchii).

“In most years, you might find one percent of seeds infected with Diaporthe,” said Block. “But in 2018 we commonly found ten percent seed infection, with some seed lots running as high as 30 to 40 percent.”

This comes after a USDA report in October predicted a larger than normal soybean crop. Many farmers were hoping the increased yield would help offset their losses from lower prices. But the rain just kept falling, encouraging spread of fungi to seeds from pods and also the deterioration of pods and plants. Corn seemed to weather the conditions, but soybeans rotted, sprouted, or shattered.

While this could mean lower soybean seed germination rates in 2019, Mike Stahr, SSC Seed Lab Manager says there is hope. While badly infected seeds won’t emerge when planted in the field and may not germinate, many of the seeds have only a mild or superficial fungal infection. A fungicide seed treatment will improve germination of seed lots with these types of seeds present. Stahr indicated that the key point is that seed treatment can’t bring a dead seed back to life or add healthy tissue to a badly damaged seed, but it can make a very significant impact if a seed hasn’t reached the point of no return.

“Seeds, which have been chemically treated, showed improvements in scores of up to 20 percent, with the most common improvement between 10 and 15 percent,” said Stahr. “At the December, 2018, American Seed Trade Association CSS Seed Conference held in Chicago, there were even reports of improvement up to 40 percent.”

For more information on seed conditioning e-mail Alan Gaul, seed conditioning specialist at the Seed Science Center or call 515-294-4011. For more information on testing “moldy” seeds and possibly improving results of testing, contact Dr. Charles Block (seed pathologist) or Mike Stahr (Seed Lab manager) at 515-294-6826 or e-mail seedlab@iastate.edu. The Seed Lab web page is available at www.seedlab.iastate.edu.
Hendrickson Retires from Seed Science Center

Regina Hendrickson started her career at ISU in 1983, as a market news editor for ISU Extension Communications Market News Broadcaster Dallas McGinnis. During her years of employment at ISU, she has performed communications and related duties for the American Association of Agricultural Economists; the Utilization Center of Agricultural Products, Meat Export Research Center; the NASA Food Technology Commercial Space Center; the Institute for Food Safety and Security; the Biosafety Institute for Genetically Modified Agriculture Products; the Seed Laboratory; and the Seed Science Center.

“I never left a campus position for promotion or personal gain, because in each job inevitably I grew so close to my co-workers and had such a deep sense of loyalty that I couldn’t imagine giving that up. I would only leave a position in the event that funding ran out,” said Hendrickson. “So, the decision to retire from the Seed Science Center was a difficult one.”

Hendrickson admits it is hard to say goodbye to the people and place she has loved for so long.

“I feel like everyone is family. During my time here, I have witnessed many exiting projects come to fruition. And, it all seems to have happened in the blink of an eye,” said Hendrickson. “Even though I will not be physically in the Center, you can rest assured I will be cheering you all on.”

After retirement Hendrickson plans to spend time with her family on the farm in Stanhope and travel as much as possible. She enjoys reading, repurposing vintage items, and creating soldered jewelry and other artwork from stained glass, metal, and other materials.

Hicks Joins Seed Science Center

Cynthia Hicks joined the Seed Science Center as a Communications Specialist in December, 2018. She fills the position left vacant with the retirement of Gina Hendrickson.

“I am excited for the opportunity to work at Iowa State University and the world-renowned Seed Science Center,” said Hicks. “I look forward to learning more about the seed industry in the coming months.”

Hicks is the former Executive Director of Ames, Iowa Main Street program and former Public Affairs Manager at Texas A&M University-Corpus Christi. She has over 25 years of journalism experience with a bachelor’s degree in Journalism and Communications from Wichita State University.
The researchers in the Seed Laboratory at the Iowa State University Seed Science Center are using new technology to ensure the integrity and quality of their work is preserved. Technology that is wireless and sends them a text message if something is not quite right.

They have installed a state-of-the-art Smart-Vue temperature monitoring system, which offers real-time data in storage areas and records that information to a server for future use. Seed Pathologist, Tracy Bruns, Ph.D., says the new system gives them, and their customers, peace of mind.

“This system will email or text the staff if a piece of equipment is not functioning correctly,” said Bruns. “This gives us reassurance that we will be able to respond quickly to issues before all testing or materials is lost.”

The Smart-Vue system, installed in October 2018, replaces an older type of monitoring system that required thermocouple wiring throughout the building and a staff person to monitor it. While this was labor intensive, it was necessary to ensure the seed lab met the specific environment conditions to comply with testing guidelines. Now the wires are gone and lab staff members are better utilized.

“Monitoring temperature is critical for effective quality management of a lab,” said Bruns. “These systems are becoming more common as people move towards relying on technology to address this issue.”

While the Smart-Vue system will help the SSC conserve resources with its minimal maintenance costs, less chance of ruined test materials, and the capacity to expand as seed testing continues to increase in the ISU Seed Lab.

**ISU-SSC to Add New Growth Rooms for Improved Research Opportunities**

The Iowa State University Seed Science Center (ISU-SSC) will break ground on a 2,000 square foot growth room addition in summer, 2019. The addition, funded by donors, will provide valuable new space for student research.

“The new growth rooms will provide both undergraduate and graduate students with unique opportunities to conduct work in a climate-controlled environment and to work with some unusual plant pathogens that require this kind of containment,” said Dr. Gary Munkfold, Professor of Plant Pathology and Microbiology at the SSC.

The new space will also increase the capacity of the SSC to conduct GMO testing, test for a wider range of seed-borne pathogens, and improve the ability to do epidemiology experiments with the plant pathogens that cannot be released into the field.

“We’ll be able to precisely measure the effects of different conditions on important phases of the disease cycle, such as seed transmission,” said Munkfold. “It will also be used to maintain sick plants that we need to use as reference material when we test seeds.”

The new growth rooms will be added onto the northwest corner of the existing SSC building. An Iowa company, Studio Melee located in Des Moines, will perform the design work. Construction is expected to be complete by the spring of 2020.
Field trials are a foundational method used by agricultural scientists in their quest to understand and translate science to practice. Traditional agronomic scale field studies are an important tool to understand key attributes of farming systems that are applied to decisions made by individual producers in their operations. However, the broader application of small scale trial results regionally over time, which is important to formulating agricultural policies, often involves subjectivity as experts draw inferences from diverse studies and findings found throughout the scientific literature.

Jeff Wolt, professor of agronomy in the Seed Science Center, and his graduate students Kayla Cappelle and Elliot Sully are exploring formalized approaches for systematic analysis of diverse agronomic data to describe the aggregated outcomes of field trials in statistically meaningful ways. These types of meta analyses are useful to planners and regulators when predicting risks and benefits of agricultural practices regionally over time and provide an objective way to understand how farming decisions may improve productively, quality, and safety.

The use of tools of meta statistics to integrate data from collections of experiments is a well-established practice with decades of use in the pharmaceutical and medical sciences. The recent popularity in using meta analyses in agriculture is complicated by the great diversity of field trial study designs and the limited numbers of quality field trails that may be available for analysis. Robust meta analyses are initiated by a systematic review to identify relevant literature. Systematic reviews use search techniques for unbiased discovery of relevant data and those data that are identified can then be subjected to a range of statistical analyses to understand the collective meaning of diverse research findings. The studies selected, data quality and statistical approaches all influence the integrity of meta analysis outcomes. The focus of Cappelle and Sully’s work is to describe the strengths and limitations of various meta analysis methods used in agriculture.

Kayla Cappelle is a Masters student in toxicology from Kaukauna, Wisconsin with a Bachelors degree in biology from Dubuque University. Kayla’s research involves developing a refined understanding of how the widespread adoption of Bt corn in Midwestern agriculture is benefiting food and feed safety through reduction in the occurrence of the mycotoxin fumonisin in grain. Working in collaboration with Dr. Gary Munkvold, professor of plant pathology in the Seed Science Center and a pioneer in the use of Bt corn to reduce fumonisin in grain, Kayla is seeking to statistically quantify the probability and magnitude of fumonisin reduction from growing Bt corn. Cappelle’s findings confirm that Bt corn significantly lowers fumonisin in grain, but also show that the magnitude of reduction regionally over time is less when described by statistically robust data than may be expected from an uncritical review of published information. These findings will allow policy experts to make more reliable estimates of the degree to which Bt corn production safetens the food and feed supply.

Elliot Sully, a native of Sydney Australia, and Masters student in plant biology, holds a Bachelors degree in crop science from the University of Illinois. Sully is investigating the effect of nitrification inhibitor use in corn for improving crop yield and nitrogen use efficiency. His work builds on recent work of collaborator Dr. Rachel Cook of North Carolina State University who has been investigating the benefits of enhanced efficiency fertilization practices, including nitrification inhibitor use, for corn production. This effort is intended to update a nitrification inhibitor meta analysis published by Wolt in 2004 using data largely from the 1990s. “Corn genetics, management techniques, and especially climate have all changed over the past couple of decades and we anticipate this to impact the meta effects of nitrification inhibitors which are quite sensitive to soil temperature and moisture at and immediately following application,” says Wolt, “Elliot is looking a newer base of information selected from throughout the world and we suspect the effect of nitrification inhibitors may prove to be less dramatic than in the past. A robust meta analysis will allow for policy makers to better evaluate the use of nitrification inhibitors as a best practice for nitrogen management.”
Awards, Recognitions, Activities

Guntuku Recognized for Scientific Excellence

Seed Science Center Global Program Leader Dileepkumar Guntuku was awarded the ISU Professional and Scientific Excellence Award during the University’s annual awards ceremony September 14 held in the Memorial Union.

The award recognizes contributions made by a professional and scientific staff member within and beyond the university and career progress demonstrated by accomplishments at Iowa State.

Stahr Serving as AOSA President

Seed Lab Manager Mike Stahr is currently serving as President of the Association of Official Seed Analysts (AOSA). Stahr took over the duties of President at the annual meeting in June 2018 in Sparks, Nevada. Stahr, who has served two years as Vice President since June of 2016, will serve as President until June, 2020. This is the second time Stahr has served as President of this organization. His first term was 2009-11.

Misra Receives ISU International Service Award

More than 60 Iowa State faculty and staff were honored during the university’s annual awards ceremony Sept. 14, in the Memorial Union Great Hall. Manjit Misra, director, Seed Science Center, was awarded the ISU International Service Award at the event. The award recognizes a faculty member for outstanding international service in teaching, research or administration within the United States or abroad.

Misra Recognized With Sukup Food Security Award

SSC Director Manjit Misra was presented the 2018 American Society of Agricultural and Biological Engineers (ASABE) Sukup Global Food Security Award at the Society’s annual international meeting held in Detroit, MI on August 1.

The award recognizes the enhancement of food security by innovative engineering or the application of engineering in the production and distribution of food.

Established in 2015 by Charles Sukup, President of Sukup Manufacturing Co., the endowed award, given annually to one recipient, recognizes the enhancement of food security by innovative engineering or the application of engineering in the production and distribution of food, including the storage and handling of grains, oilseeds, and other food products.

Goggi Guest Lecturer

Dr. Susana Goggi, Professor of Agronomy at Iowa State University Seed Science Center, was invited to give a guest lecture at the prestigious Monsanto Fellows Symposium in Saint Louis, MO., August 2018. Goggi spoke about the Mitigation of environmental effects on seed quality.
What's Behind a Label on a Bag of Seed?

The seed label, or tag as it is often referred, is like the inside jacket of a novel. It tells you everything that’s important about your bag of seed. The United States is frequently cited as one of the most reliable producers of food in the world. One of the reasons for that is because we have some of the most stringent seed laws in the world. The seed label reflects those laws. Strong seed laws provide the means to ensure plant breeder’s rights, encourage biodiversity, and greater opportunity for financial success by the grower community.

Of course, the ultimate benefit is the consumer. When you look at a seed label you’ll see a lot of numbers. But on closer look, all of those numbers are significant. The Federal Seed Act and all state seed laws require a seed label, although they vary slightly in their requirements. Most of these laws were created over 80 years ago and variances have evolved, but they generally all have the same means to an end. Some of the notations on a label are obvious, some not so much. Here’s what most states require on a seed label and what each item means:

- **Product name**: the brand name and/or species name, so the consumer knows what they are getting
- **Pure seed**: percentage by weight of the desired seed(s) based on the entire contents of the bag
- **Other crops seed**: percentage by weight of seeds not considered weed. If the amount is over 5% (generally) then those species are considered Pure Seed and are to be listed by name. In some cases those species present at 5% or less may also be listed as Pure Seed if so desired by the seller.
- **Weed seed**: the percentage by weight of weed seeds unless they are considered restricted noxious weed seeds by law where the seed will be sold. If they are restricted noxious weed seeds, then they must be listed individually by name and are limited to the amount in the state law (usually around 0.25%). (NOTE: prohibited noxious weed seeds are not allowed at all)
- **Inert matter**: the percentage by weight of whatever is in the package that doesn’t grow (i.e. broken seed that are half or less what was

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**RELATIVE MATURITY: OVERALL -111**

**GROWING DEGREE UNITS MID-POLLINATION: 1330**

**BLACK LAYER: 2775**

**LOT NO. 754TKN4JX**

**ORIGIN GERM DATE TESTED**

**VARIETY A1028581**: 89.00% IA 95% 11/12

**VARIETY A1031279**: 10.00% NE 95% 11/12

**INERT MATTER**: 0.40%

**WEED SEED**: 0.00%

**OTHER CROP SEED**: 0.60%

**NOXIOUS WEEDS/LB**: NONE

**SUGGESTED PLATE**: JD B1

**FIELD CORN**

**RTMT**: WA1H

**C1H C1X**

The seed in this container consists of the two identified field corn varieties. It is a mixture under the state laws of AL, AK, AZ, CT, DE.

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**Wolt Retires from ISU**

Jeff Wolt, professor of agronomy at ISU and a risk analyst for the Seed Science Center since 2004, retired in 2018. Wolt’s program in the Seed Science Center involved risk assessment and analysis for new technologies in plant agriculture with emphasis on genetically engineered crops and more recently genome edited crops. Wolt’s training was in soil chemistry, but he transitioned to biotechnology risk assessment in midcareer with a focus on emerging technologies in plant sciences which led him in recent years to co-direct the Crop Bioengineering Center at Iowa State University.

“Jeff has been a great colleague, educator, researcher, mentor, and friend to all of us here at the Seed Science Center,” said Seed Science Director Manjit Misra. “He will be greatly missed.”
Seed Analysts (AOSA, which is composed of state, federal, university and some crop improvement labs) and the Society of Commercial Seed Technologists (which is composed of analysts from seed companies, private labs, crop improvement labs and some AOSA labs) jointly give certification exams. A person must provide evidence of training (related college courses; workshops and training within their lab) and experience to qualify to take the exams. A person passing both exams becomes a Registered Seed Technologist (RST) and is able to sign and put their seal on reports of analysis. Certified analysts must show evidence of continuing education & proficiency testing to remain in good standing.

Seed labs can conduct more than 50 distinct types of tests. A number of these are not used to provide information for the label, but rather provide supporting information (such as vigor) to the seed company. Many states require testing for the label to be done according to the AOSA Rules for Testing Seeds and seed produced in one state and sold in another must meet the requirements of the Federal Seed Act and its regulations. Others don’t list the AOSA Rules.

A mechanical purity test is done on approximately 2,500 seeds, while a noxious weed exam is approximately 25,000 seeds. Seeds aren’t counted out, but rather a table in the Rules lists the required weight for more than 700 species of seed. Some seeds are easy to identify, but others (example: Quackgrass from Western Wheatgrass) take a highly trained person with good eyes and a lot of patience. The standard (or warm) germination test is conducted under conditions considered ideal and so its results are likely the maximum germination rate of that seed. It must be remembered that fields (gardens, etc.) vary in soil type, fertility, fungal & insect population, environmental conditions, etc. and so the germination percentage or the result of a vigor test may or may not match field emergence. Vigor of a seedling isn’t considered in the germination test, but rather that the parts of a seedling are present and not badly damaged mechanically or by fungi or insects. Volume four of the AOSA Rules provides information on how to classify seedlings as normal or abnormal according to the species of seed. Also determined in the germination test is the percentage of dead seed, dormant seed (those that take up moisture, but don’t grow) and hard seeds (certain types of seeds that can have a seed coat that doesn’t allow water to penetrate until later).

As you can tell, there is more to a bag of seed than meets the eye. However, a grower can find out all they need to know by studying the seed bag label. And then, like reading a novel, they’ll know the rest of the story.
most of the seed lots tested in 2018 were of high quality with no problems. The exception was soybean seeds.

“Frequent rains and muddy fields caused a delayed harvest which was favorable to fungal infection,” said Block. “This past season, we observed a big increase in Diaporthe pod and stem blight in soybeans.” Read more about the issue with soybeans in 2018 on page 3 and page 11.

The USDA has also asked the SSC to look into the situation of seed imports from other countries. This started with discovery of the Cucumber Green Mottle Mosaic Virus (CGMMV) in California in 2013. The introduction of this disease, which effects cucurbits, has led to increased screening of imported seeds and an import-testing pilot program operated by the National Seed Health System at SSC. Read more about the pilot program and CGMMV testing on page 12.

Because of this, the center expects seed testing to continue vigorously in 2019.

“It is hard to predict the future, but international trade issues and regulations never seem to get simpler,” said Block.

**ISU Student Receives Lambert Scholarship**

Alyssa Dougherty, a junior at Iowa State University studying dietetics and global resource systems, is the recipient of the 2018 David Lambert Hunger Fighter Memorial Scholarship.

The $1,000 scholarship was created in honor of Lambert’s lifetime efforts addressing global food security and child malnutrition.

“Lambert was a Distinguished Fellow in the Seed Science Center at Iowa State University, a supporter of the World Food Prize and a tireless fighter against world hunger,” said Manjit Misra, Director of the Seed Science Center at Iowa State University.

The scholarship is awarded to one sophomore or junior each year who exhibits a demonstrated interest in seed science, global food security and childhood nutrition, and is administered by the Seed Science Center at Iowa State.

Dougherty, whose hometown is Epworth, Iowa, shares the same passion that Lambert did, and plans to further her passion through the scholarship.

“Words can’t express how truly grateful I am to have received the scholarship,” Dougherty said. “I aspire to follow in David Lambert’s career.
Seed producers and farmers in southern Iowa struggling through dry conditions this summer probably never dreamed they would be dealing with weeks of rain this fall. If you live in the Midwest you are undoubtedly accustomed to swings in temperature and precipitation, but it is probably safe to assume you haven’t experienced a fall like this one. Iowa experienced a wet spring, followed by a dry July and a resurgence of rain in August and September. Wet conditions are conducive to fungi growth, especially in cereals and soybeans. Farmers planning to plant rye seed they harvested as cover crops in their fields were likely shocked with warm germination test results required by NRCS and for farmers wishing to sell cereal seed to their neighbors. In general, seeds looked good, but germination test results in the 40-70 percent range were not unusual.

New crop soybean seed has been arriving at the Iowa State University Seed Testing Laboratory and it looks like it could be a tough year for soybean seed quality. Foggy, rainy weather this fall facilitated Phomopsis to spread from pods to seeds. Wet weather encourages spores within overwintering structures known as pycnidia to germinate and move to seeds. October’s wet weather with occasional dry periods will also likely lead to cracking of seed coats, increasing amounts of fungi, and possibly to pods shattering before or during combining.

The best bet for producers is to have a warm germination test conducted on bin run seed. Running this test will help producers know if seed quality has dropped and if there is a problem with fungi. Although a fungal screen using blotters or agar plates conducted by a seed pathology lab is the most accurate way of identifying the presence of fungi and determining the level of infection, the germination test can also provide useful information.

Based on the bin run results, conditioning seed can significantly improve quality. According to Alan Gaul, seed conditioning specialist at the Iowa State University Seed Science Center, useful cleaning equipment for conditioning soybean seed include an air screen cleaner, spiral or belt separators, gravity table, and color sorter. Although color sorters have gained wide acceptance, the most significant improvement will often come from increasing the air during post-aspiration, using a spiral separator or gravity table, and finishing with a color sorter.

A viable option in most cases is to treat the seed. The effectiveness of treatment will depend on the severity of fungal damage. Seed treatments have proven effective, but reach their limit when seeds are damaged to the point of no return. Some seed labs custom treat seeds upon request. When germs are unexpectedly low, it might save time and money for a seed company or farmer to have a lab treat seeds from a seed sample and then conduct another test. If the producer treats the seed lot because of the success of the custom treating of the seed sample, then another germination test must be done on the finished product. If seed treatment isn’t an option due to seeds being organic, then germination results may be improved by planting in sand or in rolled paper towels rather than using creped cellulose paper (i.e. Versapak TM). Seedlings growing in sand or towels have the advantage of friction removing seed coats. Seed coats can have fungi present, while the seed itself does not.

The Iowa State University Seed Lab offers many services and educational experiences to help you maintain the best health in your seed. For more information on improving seed quality through conditioning, contact Alan Gaul at agaul@iastate.edu. For information on fungal infection of seeds or testing low quality seeds contact the Seed Lab at 515-294-6826 or seedlab@iastate.edu.
The Seed Pathology Laboratory located in the Iowa State University (ISU) Seed Science Center (SSC) welcomes a new Postdoctoral Research Associate to the staff.

Rodrigo Pedrozo, Ph.D. started in November 2018 working on the spread of two important seed diseases found in plants which grow gourds, one of which is new to the United States. Cucumber Green Mottle Mosaic Virus (CGMMV), first discovered in other parts of the world in 1935, showed up in the United States in a melon seed field in California in 2013. The disease can cause serious losses, including unmarketable fruit and potentially infected seeds from infected plants. This is damaging to both the seed industry and the fresh market. ISU Seed Pathologist Tracy Bruns, Ph.D. is determined to stop the spread of this harmful virus.

“This disease can be quite hard to eliminate once it is established in an area,” said Bruns. “Since the original CGMMV detection was linked to an imported seed lot, the risk of imported cucurbit seed

(Continued on page 16)

New SSC Researcher in Pursuit of Improved CGMMV Management Strategies

The Seed Pathology Laboratory located in the Iowa State University (ISU) Seed Science Center (SSC) welcomes a new Postdoctoral Research Associate to the staff.

Rodrigo Pedrozo, Ph.D. started in November 2018 working on the spread of two important seed diseases found in plants which grow gourds, one of which is new to the United States. Cucumber Green Mottle Mosaic Virus (CGMMV) is common throughout Europe and Asia, but was not discovered in the U.S. until 2013. Pedrozo hopes his work at ISU will help shed some light on this plant pathogen as well as Gummy Stem Blight (GSB) and lead to improved disease management strategies. He says he is excited about the opportunities for collaboration at the Seed Science Center.

“Here at the Seed Science Center, there are experts in the areas of seed production, quality and safety. The whole package is here,” said Pedrozo. “Working alongside these professionals facilitates my pursuit for answers.”

Pedrozo completed his Ph.D at Kansas State University where he was the first to discover and report two new pathogenic species of Fusarium on soybeans. Originally from Piracicaba, Sao Paulo, Brazil, Pedrozo received his undergraduate in Agronomy and graduate degree in Plant Pathology from Universidade Federal de Lavras. New to the Ames community, he also enjoys photography and even won first place in the APS Art in Phytopathology Contest in the digitally altered category.

Rodrigo Pedrozo, Ph.D
Started at SSC in November, 2018

*Fusariumland: a world of colors and shapes* was awarded first place in the “APS Art in Phytopathology Contest” in the category “digitally altered category”
The first thing that George Washington Carver Summer Research Intern Elsa Calderon noticed when she arrived at the Seed Science Center to begin conducting research with Agronomy Professor Susana Goggi was the statue of George Washington Carver. “It really moved me,” said Calderon.

A graduate student from the University of Tuskegee in Alabama, Calderon was one of seventeen 2018 George Washington Carver interns conducting research at ISU this summer. The students hailed from 11 states, including Puerto Rico. Calderon and her family are from San Antonio, Texas.

Normally, undergraduates are chosen to take part in the program, but Calderon, a graduate student getting a masters in plant and soil science, is an exception to the rule. Calderon contacted program coordinator Theresa Cooper explaining that she wanted to come to ISU to work with seed treatments.

“Theresa suggested Elsa to contact me directly, so she did,” says Goggi. “She expressed her interest in joining my research team for the summer and explained her research idea. She asked me if that is something that I would be interested in, and I said yes.”

Calderon studied the biocontrol properties of vermicompost extract on soybean seed germination and vigor. She used vermicompost of her own preparation, and collected additional compost samples from university compost piles consisting of manure from ISU animal farms mixed with other campus and yard waste. Next she placed the vermicompost in water and let air bubble through it. After 48 hours, she diluted the extract and used each extract to moisten a different set of seed germination towels. Two controls were used to compare the effects of these extracts, a set of towels moistened with a growth hormone gibberellic acid (which is known to enhance seed germination), and another set with water. After seed germinated (7 days), Calderon collected seed germination percentage and seedling dry weight data and compared the germination rate of the seeds after these treatments.

All compost tea extracts increased seed vigor over gibberellic acid and water controls. This enhanced seedling development resulted in heavier seedling dry weight. However, seed germination percentage was not affected. From these results, Calderon concluded that compost tea extracts may be a suitable treatment to improve the vigor of soybean seeds without inhibiting germination.

Calderon, who grew up in New York, does not come from an agricultural background. Her parents wanted her to be a doctor or lawyer, so it was a shock when she chose the field agriculture instead. “My interest in agriculture started in high school,” said Calderon.

“I joined a farmer’s program for urban gardeners, and it piqued my interest.” said Calderon. “I liked actually having an interaction with the produce coming from the ground, because in New York City you live in apartments.”

She received a master’s degree in Agriculture from the University of Tuskegee at the end of Fall, 2018. She says her dream is to be a professor in an ag-related field.

“I like plants and soil, and I would love to teach something like that combined, and eventually have my own demonstration farm that focuses on sustainability,” she said. “I would like to teach students—especially middle and high school students, hands-on practice in agriculture because it made a difference to me growing up.”

During her time in Ames, Calderon says she grew to appreciate the strong connection that Iowa State has with George Washington Carver. “Coming from Tuskegee, and then arriving here and seeing the strong influence of George Washington Carver on this campus is amazing, “ she said.
The Seed Technology and Business (STB) Graduate Program at Iowa State University (ISU) successfully completed their second annual Seed Science & Technology short course November 5-9, 2018. The weeklong short course, a companion course to the Seed Business Management short course which will be offered again on February 4-8, 2019, was attended by seed industry professionals from across the United States, Canada, and South America.

The Seed Science & Technology short course benefits both new and veteran seed industry leaders by providing a one-of-a-kind learning experience focusing on the seed product lifecycle and current industry technologies. This comprehensive course, led by Seed Science Center faculty and seed industry experts, provides hands-on demonstrations, industry tours, and discussion sessions to help provide a clear picture of the many facets of the seed industry, including an in-depth look into Seed Production, Crop Improvement, Post Harvest Management, Seed Health and Quality testing, and Seed Physiology.

“There was a great connection between academic concepts to how these concepts are used in industry,” said Chad Kimmelshue, ISU graduate research assistant in Agronomy.

The November 2018 session included tours of the Corteva Agriscience Dupont Integrated Seed Science Center, Ankeny, IA; North Central Regional Plant Introduction Station, Ames, IA; Huxley Learning Center, Huxley, IA; and the Bayer seed production facility, Boone, IA.

Invited guest speaker, David Beck, independent plant breeding consultant and former corn breeding project lead for Syngenta and CIMMYT, gave a comprehensive presentation regarding the Pigeon pea: from breed to seed. The short course also hosted guest speakers Dr. Jeanne Serb and David Wright who shared a brief look into the biotechnology services available at Iowa State University.

Short course participants felt the session topics were broad and understandable; and provided critical information to anyone involved in the seed industry.

“If you are seeking a further understanding of the seed industry and how the various modules relate to and interact with one another, this is the course for you!” said Tanner Odom, Genective USA Corp.

The STB Graduate program will continue to offer these short courses annually as a way of giving industry professionals more opportunities for continued education.

The Seed Business Management short course is coming up soon. Guest speakers from Corteva Agriscience, Renewable Energy Resources, and faculty from the Ivy College of Business are just a few of the highlights scheduled for the week. For more information, or to register for the Seed Business Management short course, Feb. 4-8, 2019 or the Seed Science & Technology short course offered again Nov. 4-8, 2019, visit: www.seedgrad.iastate.edu/stbsh or contact us at stbshortcourse@iastate.edu, ph. 515-294-6947. Seating is limited.

Participants of the Seed Science & Technology short course held Nov. 5-9, 2018, in Ames, IA included: Mark Slovacek, Ag Alumni Seed; Casey Perkins, Ag Alumni Seed; Alan Gaul, STB short course instructor; Chad Kimmelshue, Iowa State; Karl Nicolaus, Iowa State; Tanner Odom, Genective USA Corps; Fernando Mauri Marcos, Iowa State; Matthew Trinh, Bayer; Shane Svoboda, BASF; Todd Rice, Ag Alumni Seed; Mike Stahr, STB short course instructor; Emilio Do Carmo, Syngenta; Hamid Naeem, Agriculture and Agri-Food Canada; Laura Wood, Corteva; Rodrigo Pedrozo, Iowa State; Connie Ripberger, Corteva; Cindy Robertson, STB short course coordinator; Gary Munkvold, STB short course director; and Lori Youngberg, STB graduate program coordinator.
Save-the-Date for 2019 Seed Quality Workshops

Seed Conditioning Specialist Alan Gaul and Seed Lab Manager Mike Stahr facilitate Seed Science Center shortcourses and workshops for seed industry professionals around the world each year from April through August. This year a total of 15 workshops and shortcourses covered topics from seed testing and cleaning, to gravity separation, color sorting, and seed treatment.

According to Gaul, one highlight of this the workshops series is the Seed Treatment Workshop in mid-July. “We had an opportunity to hold the workshop in the Hansen Agriculture Student Learning Center for the first time,” said Gaul. “Because there was basically no limitation on the amount or size of the machinery that we used for demonstrations, that workshop was an extremely effective and enjoyable one. We hope to be able to use that venue again in the future.”

The Seed Science Center at Iowa State has provided training for seed industry professionals for more than 42 years. Seed Industry professionals have traveled all over the U.S. and the world, including Canada, China, Germany, Mexico, Turkey, the U.S., and Zambia to attend seed conditioning and quality workshops at Iowa State.

Don’t Miss the 2019 Seed Analyst Short Courses

In 2019, the Seed Science Center will once again offer three Seed Analyst Short Courses. Feedback from the 2018 course participants was extremely positive. Seventeen individuals participated each week of the 2018 Seed Analyst Short Course.

Attendees of Germination Week had the opportunity to evaluate seedlings from 16 species of seeds, and conduct tetrazolium testing on four species.

Purity Week focused on methods to distinguish the many seed species that analysts may potentially encounter when conducting mechanical purity tests or noxious weed exams. Hands-on work was also offered.

On Friday of both weeks, a respective Association of Official Seed Analysts (AOSA) and Society of Commercial Seed Technologists (SCST) consolidated exam was given to participants. Written and practical components of the exams reflect the knowledge and abilities of each analyst, and eventually lead to certification as an RST (Registered Seed Technologist) or a CSA (Certified Seed Analyst).

For more information about these Seed Science Center training opportunities and to register: http://register.extension.iastate.
has been at the forefront of concerns to protect the U.S. from additional introductions of the disease.”

Bruns is part of the NSHS team operating a United States Department of Agriculture (USDA) import-testing pilot program for this disease. The National Seed Health Accreditation Pilot Program (NSHAPP) is a voluntary system of testing seed imported into the United States. CGMMV is the first pathogen tested under the program. Bruns says testing of imported seed lots for this virus can be an effective screening measure to mitigate the risk.

“Roughly 25,000 imported cucurbit seed lots have been tested under this program since January of 2016,” said Bruns. “Out of those, 31 lots tested positive for CGMMV and were re-

exported or destroyed to stop the seed from being planted or sold in the U.S.”

The companies who participate in the program are large seed companies and seed brokers who are accredited by NSHS to routinely test seed for diseases. Bruns believes additional impact would come from participation of smaller companies who may not be aware of the risk or don’t have the resources to test all of their imported material. She is working hard to make that happen and says while the risk of seed borne diseases is always present, everyone benefits when the risk is managed through testing.

“The seed company will know they have done their part to protect the consumer, the production area, and themselves from the risk of outbreak,” said Bruns.

The NSHAPP is operated with funding from the USDA Farm Bill. Bruns’ role is to stay in touch with program participants and collate the monthly data, which she reports to the USDA. She also works with other scientists around the world to understand the methods of testing for CGMMV that are in use elsewhere and help harmonize testing procedures. It is a natural fit with the mission of the NSHS and the work done at the ISU Seed Lab and the SSC.

“We have great relationships with many people and companies within the seed industry,” said Bruns. “Working with them on these issues to take a proactive approach is a win for everyone.”

For more information on CGMMV and NSHAPP visit seedhealth.org/nshapp

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Misra Receives Outstanding Achievement in International Agriculture Award

By Megan Lutz, College of Agriculture and Life Sciences Communications Service

“I like seeds... in each one of them is that urge of life waiting to express itself,” said Manjit Misra, the director of the Seed Science Center. “They’re so tiny but they are a powerhouse.”

Misra is originally from India and in 1971 moved to Missouri where he “got two degrees and met his wife.” He has been at Iowa State since 1979 and is receiving the Outstanding Achievement in International Agriculture Award.

“This is the first job and the only job I’ve ever had,” Misra said. “And seed work is what I do, it’s the beginning of ag and the renewal of ag.”

Misra works with people from all over the world and said working at the global level makes a big impact.

“The seed center has worked with 80 countries,” Misra said. “We work with countries to assess what the seed quality obstacles are and how they overcome them.”

Many countries do not have a seed industry and the center helps them to begin building that industry or improving what they have. It’s important, Misra said, to build relationships.

Susana Goggi, professor in the Seed Science Center, works with Misra at the Center.

“He directs center faculty by allowing them the freedom of scientific exploration, helps to promote their academic growth and offers unconditional support,” Goggi said. “He is undoubtedly our biggest cheerleader.”

Misra looks at the seed as the solution to both hunger and food security. He said helping others and helping people feed themselves is the most important work he does.

“What can we do to help hundreds of thousands of farmers,” Misra said. “How can we do something and then do it better.”
Dougherty realized the significance of food security for the first time in high school. “My eyes were opened by the Iowa Youth institute and Global Youth Institute, two events hosted by the World Food Prize,” Dougherty said. “At these conferences, I came to understand the gravity and complexity of local and global food security. It was here that I was inspired by Dr. Norman Borlaug and his quote: ‘Food is the moral right of all who are born into this world.’”

Aside from her studies, Dougherty has found other ways to be involved in aiding world hunger. She is involved in SHOP, a student food pantry, the Student Dietetic Association and the World Food Prize Foundation. She is also a part of the Honors Program, is an International Friendship Connection Group Leader and recently raised over $7,500 with friends for the Food Forward South Africa and a youth center in South Africa.

Dougherty has also taken her global food security advocacy international. She was a 2017 Borlaug-Ruan International intern in Guatemala, where she gained valuable research skills and gained hands-on global perspective.

After graduation, Dougherty plans to apply for the Iowa State Dietetic Internship with an international placement in Ghana, become a registered dietitian and then get a master’s degree in international nutrition.

Dougherty hopes all of these accomplishments help lead her to her ultimate goal. “As I firmly believe you cannot live a full life on an empty stomach, my life goal is to increase food security by advocating for sustainable agriculture and nutritious food systems,” Dougherty said.

The Seed Science Center is a center of excellence in seeds at Iowa State University. Its mission is to improve the production, quality assurance, marketing, utilization and regulatory environment of seed through research, testing, teaching, outreach and international programs.

STB Program Celebrates Over 10 Years of Delivering Online Education

Directed by Manjit Misra, the Iowa State University (ISU) Seed Science Center (SSC) has a history of providing quality research and education to produce the next generation of leaders in the seed industry. That commitment is reflected in the success of the online Graduate Program in Seed Technology and Business (STB) which recently celebrated its 10th anniversary.

Launched in 2007, the STB program was the first of its kind in the nation to offer a multi-disciplinary master’s degree to individuals with an interest in seed. Designed to educate seed industry professionals in the areas of seed science and technology and business administration, it allows individuals to continue to work full-time while studying online for a Master of Science degree part-time.

“This past year was an incredible year for the program,” said STB Program Coordinator Lori Youngberg. “We not only celebrated our 60th graduate and received recognition as one of six great online graduate certificate programs in agriculture by Ag Daily in May, but we also conceived and launched a successful new on-campus short course to meet the demands of a changing seed industry.”

STB’s Seed Science and Technology and Seed Business Management on-campus short courses are designed for individuals who have shorter period of time to devote to enhancing their leadership skills. They cover similar topics to the graduate program, but in a less comprehensive way.

“Both of these week-long short courses are a great way to get an introduction to the topics covered in the online graduate program,” says Professor and Director of the STB graduate program, Gary Munkvold. “Designed to be taken together or separately, they offer top speakers from industry addressing issues of key importance to those in seed leadership positions.”

Short course participants can apply to the graduate program after completion and have introduction course requirements waived. Find more information about the shortcourse on page 14.

For more information about the STB online graduate program or online learning in the College of Agriculture and Life Sciences at Iowa State University, please contact Lori Youngberg at 515-294-9137 or email seedgrad@iastate.edu.
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