PathogeNews

Department of Plant Pathology
2022 Annual Newsletter

DEPARTMENT OF PLANT PATHOLOGY

UNIVERSITY of NEBRASKA–LINCOLN

WE ARE NEBRASKA

JOIN US

Here in the Department of Plant Pathology, we're big on making big impacts. Our passion lies in solving challenges at the microbial level that affect sustainable plant productivity. And we do it all while training the next generation of plant pathologists.

We'd love to hear how an advanced degree in plant pathology from UNL will benefit you.

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DEPARTMENT OF PLANT PATHOLOGY

M.S. & Ph.D. Programs

plantpathology.unl.edu/apply

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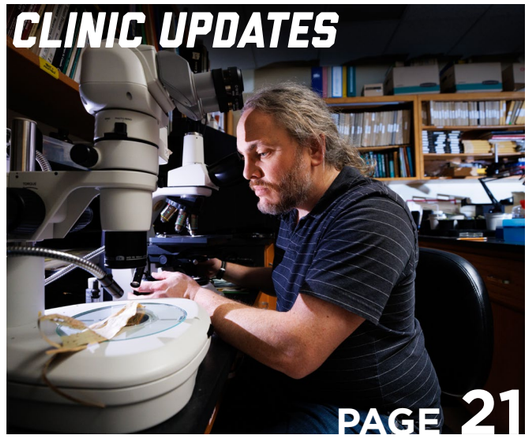

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Front cover photo: Tar spot (*Phyllachora maydis*) of corn is moving west across Nebraska. Credit: Dr. Tamra Jackson-Ziems

PathogeNews is an annual publication from UNL's Department of Plant Pathology.
Editor & Designer: Madilyn McKay
Editor: Amber Hadenfeldt

All Lab Highlights were written by each respective PI. All photos are from faculty, staff, and students within the department, or from the UNL digital photo archive.

Letter

FROM THE HEAD OF THE DEPARTMENT
DR. LOREN GIESLER

Greetings from the Department of Plant Pathology at the University of Nebraska-Lincoln. In 2022, we transitioned out of the COVID-19 pandemic and reengaged in person. The impacts of the pandemic have resulted in lasting change in our work environments, and some level of remote work continues for many. Much of our year was devoted to searching for new faculty to join our department, and we completed four successful searches. Our department hosted the APS North Central Division meeting in June and welcomed our colleagues for a very student-focused meeting in Lincoln, which was the first in-person meeting for the last two years. In the fall of 2022, our department engaged in an Academic Program Review (APR). Preparation for this process involved year-long faculty engagement to develop a self-study document for the APR Review Team (see page 20).

This year we are providing lab highlights from each program and spotlighting the success of all our team members. Our faculty do amazing work that collectively serves our three mission areas of extension, teaching, and research. The continuum of basic to applied research is clear among our team, and they all work to serve the greater mission of ensuring a sustainable and ample food and fiber supply to support our growing global population. This marks my forth year as head of the department, and I continue to find it humbling to serve in this capacity. Our faculty, staff, and students all have amazing achievements across our field of science. Below are a few highlights from 2022.

- Two faculty became APS Fellows (Bob Harveson and Satyanarayana Tatineni (TS)).
- Two new faculty started in 2022 (Dylan Mangel and Teddy Aroca-Garcia).
- Our department supported 2 Ph.D. graduate degrees.
- Our students were recognized with 25+ local and national awards.
- Technologist Brad Tharnish received the Lambrecht Award – this award is the result of an endowed foundation in memory of Patricia Lambrecht (Technologist for Anne Vidaver).
- Dr. Gerry Adams retired from his appointment as Associate Professor of Practice.
- Faculty secured over 1.9 M in funding to support their programs in research and extension.
- The Inclusive Excellence Advisory Group advanced their work and developed a new award program (Green Thumb Awards and Annual Department Service Award).

It has been wonderful to get back to more normal engagement and resume travel to meetings over the past year. We look forward to continuing to engage and use the tools that were developed to improve our abilities to work efficiently during the pandemic. We are so excited to have our new faculty and there is a great energy in the department with excitement for our future.

Wishing you all the best in the remainder of 2023!

Letter

FROM THE PLANT PATHOLOGY GRADUATE STUDENT ASSOCIATION PRESIDENT, MICHAEL RICHTER

The Plant Pathology Graduate Student Association (PPGSA) consists of Masters and Ph.D. students working within the plant pathology department. Our students are working on projects from all areas of plant pathology, encompassing a large breadth of plant pathogens and plant diseases. This year, we initiated outreach activities with a local high school, continued efforts to build social connections within our student body, and grew our professional network within and outside of the department.

Something we proudly hosted with the help and guidance of our Plant & Pest Diagnostic extension educator, Kyle Broderick, was the Plant Pathology booth at the Farmers Market and the East Campus Discovery Days. Students were able to interact with community members and answer their questions on what plant pathology is, how to protect their plants, and why the work we do in the department matters. The booth was a great opportunity for students to build their communication skills and learn about a wide variety of plant diseases. In line with outreach, PPGSA established connections with the Northeast Lincoln High School and hosted the Plant Pathology booth and offered a hands-on learning experience at an afternoon club there. We strive to further deepen our involvement with local high schools to make the name of our department heard and awaken interest in plant pathology early on.

The 2022 Annual Elevator Speech Contest was an enormous success and was offered in a hybrid format. This event is a collaboration between the Plant Pathology, Agronomy, and Entomology departments, which gives students the opportunity to practice communicating their research in three minutes, Multiple students from PPGSA participated and two of our students, Mahnoor Asif and Shiv Singla, played major roles in organizing this event.

PPGSA has also been very active internally by planning socials, faculty-student engagement lunches, and monthly general meetings. Students have participated in board game nights, bowling, an ice cream social, Halloween pumpkin painting, and a holiday cookie-baking social. For our faculty-student engagement lunches, Plant Pathology faculty or other university members are invited to discuss topics that enhance students' professional development. Additionally, PPGSA has initiated monthly zoom networking sessions with other universities in the North Central division of the American Phytopathological Society. These sessions allow our students to expand their professional network, learn about research being conducted at other universities, and identify future opportunities and collaborators.

All of these activities and opportunities would not be possible without the substantial effort from the 2022-2023 officer team. Many thanks to them for their commitment to making PPGSA great!

PPGSA IN ACTION

Right: Katherine LaTourrette gives a presentation on Scottish Folk Dancing at the first International Food Night. International Food Night is an annual celebration of diversity organized by our students. Faculty, staff, students along with their friends and family are invited to bring a culturally significant dish, present about a cultural practice or event, or just come to the event to expand their world view (and palates!)

Left: Dr. Dylan Mangel, Mahnoor Asif and Michael Richter staff the Plant Pathology booth at the 2nd annual East Campus Discovery Days.

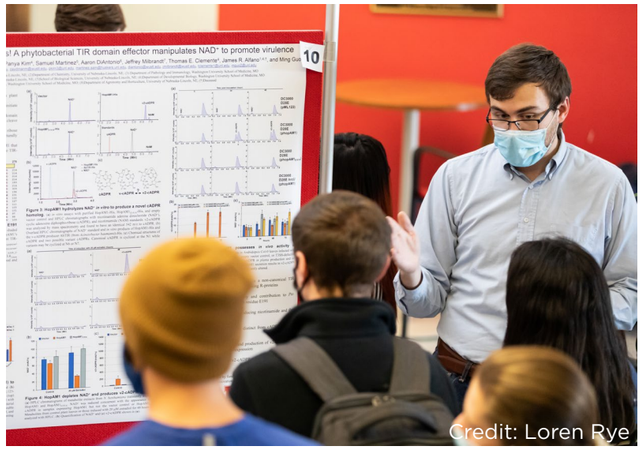
2022-23 OFFICERS

President: Michael Richter
Vice President: Mahnoor Asif
Treasurer: Chikoti Mukuma
Secretary: Nawaraj Dulal
GSA Representative: Chris Termunde
Social Media Coordinator: Katherine LaTourrette
Faculty-Student Engagement Lunch Coordinator: Chikoti Mukuma

Above: PPGSA members pose with Dr. Loren Giesler at one of their 2022 social events--bowling at the East Campus Lanes!

Above: PPGSA officers (left to right): Chikoti Mukuma, Mahnoor Asif, Chris Termunde, Katherine LaTourrette, Michael Richter, and Nawaraj Dulal.

MARVEL-ING AT MICROBIOLOGY



Credit: Loren Rye

Above: Alumnus of the undergraduate Microbiology program, Samuel Eastman, who is also a recent graduate student in the Department of Plant Pathology presents his research to a group of Microbiology undergraduate students.

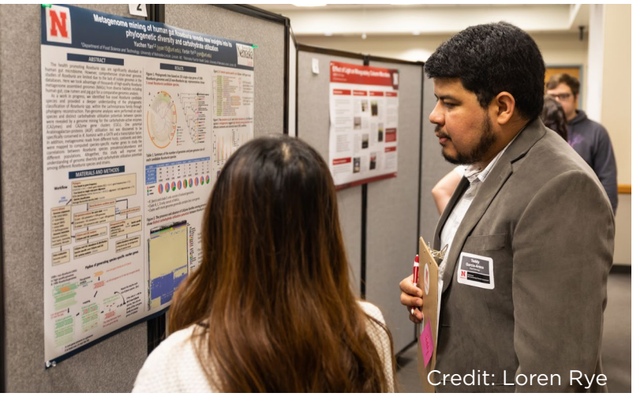
The UNL Microbiology Program is an inter-college, inter-departmental undergraduate program that currently serves about 130 students at UNL. Students have a wide range of interests and career goals, including plant pathology. In addition to an advisory board and curriculum committee, academic programming to support students' academic success and career preparation falls under the guidance of the Microbiology Program Director, Dr. Karrie Weber (School of Biological Sciences & Earth and Atmospheric Sciences), and the Academic Success Coordinator, Dr. Brandi Sigmon (Plant Pathology).

Key needs for students in the Microbiology program include earlier participation in experiential or hands-on learning and also building a sense of community and belonging for students.

To meet these needs, the Microbiology Achievement through Research and Valuable Experiential Learning, or MARVEL Program, started in 2021 with the goal of supporting the academic success and building community for undergraduate students in the Microbiology program at UNL. Currently, the MARVEL Program organizes two events a year including a workshop and the UNL Microbiology Research Symposium during each fall semester. These events are open to all Microbiology-affiliated faculty, staff, students, and alumni regardless of their departmental affiliations. However, participation in both of these events is required by the first- and second-year students enrolled in the MBIO 101 course. By participating in these events, students learn about the breadth of Microbiology as a discipline, connect with others in their interest areas, and begin to seek out research

Credit: Loren Rye

Above: MBIO 101 student, Tyler Lewis, presents a poster for the MBIO 101 class experiment. Participation at the symposium also provides an opportunity to practice science communication for MBIO 101 students.



Above: New faculty member Dr. Teddy Garcia-Aroca discusses research with a student poster presenter at the 2nd Annual Microbiology Research Symposium in 2022.

opportunities on campus.
We plan to develop a set of four rotating themes for the MARVEL workshop which will build a skill set for workshop participants as they come back each year. Currently we have developed and delivered workshops on the mentor/mentee relationship as well as networking activities and best practices. These themes were picked based on feedback from the UNL Microbiology community and current student needs. Future workshops will be developed to complement our existing workshops so Microbiology students will have a knowledge base and skill set to ensure a solid foundation as they prepare for their future careers or graduate programs.

LEARN MORE:

To learn more about the Microbiology undergraduate program, please visit ***microbiology.unl.edu***

Program Contacts

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Right: The 2022 MARVEL Workshop titled *Finding Your Network* featured networking activities for participants and a discussion panel composed of individuals from various backgrounds and career stages who discussed their networking insights and experiences. Microbiology major, Logan Hake, moderated the discussion forum and also served on the planning committee.

FRESH FACES

Amany Gomaa
Ph.D. student,
Dr. Hernan Garcia-Ruiz

Chikoti Mukuma
Ph.D. student,
Dr. Tamra Jackson-Ziems

Chris Termunde
M.S. student,
Dr. Tamra Jackson-Ziems

Dr. Dylan Mangel
Assistant Professor
Soybean Pathology

Dr. Teddy Garcia-Aroca
Assistant Professor
Fungal Ecology

Pratibha Karki
M.S. student,
Dr. Dylan Mangel

Sarah Adam
Research Technologist
Dr. Dylan Mangel

Talon Mues
M.S. student,
Research Technologist
Dr. Tamra Jackson-Ziems

David Kihoro Sirengo
Ph.D. student,
Dr. Tom Powers

Welcome to all new members of our department! We're happy you're here.

STEPPING INTO INCLUSIVE EXCELLENCE

Since forming in 2021, the department's Inclusive Excellence Advisory Group has remained active in recommending and implementing activities to progress diversity, equity, and inclusion (DEI) efforts. At the start of the year, the group developed the following DEI statement to confirm the department's values and intentions.

"The Department of Plant Pathology values all its members and their contributions and is committed to engaging in practices that celebrate diversity, promote inclusion, strive for equity, and foster a sense of belonging. We believe people, like plants, thrive in an environment that is positive, encouraging, and nurturing, and it is our priority as a department to sustain and build this environment and culture."

The Advisory Group developed a DEI webpage on the department website to share this statement and related resources at the local, IANR, and University levels. The department also maintains a DEI bulletin board in Plant Sciences Hall and continually shares resources through emails and digital signage on the building monitors.

In July, the Advisory Group released an official recommendation to develop and implement a department orientation for new graduate students. The goals of this event were to welcome new members and facilitate introductions, review program requirements and student resources, and provide a support system to new students by encouraging department members in all position types to assist with onboarding and mentorship. The orientation would be followed by first semester and first year check-ins to ensure communication continues between students and their support network. The first orientation was held in the fall of 2022. The Department Head, Graduate Committee Chair, Graduate Coordinator, Administrative Associate, PPGSA President and Vice President, and faculty advisors and technologists of the labs receiving students all attended in support of their new team member.

The second recommendation made by the Advisory Group was to implement internal awards to show appreciation for department members, recognize their contributions, and increase a sense of belonging. The Green Thumb awards were released in the fall to recognize those who have made a positive impact on department members. There is no limit to how many people can receive this recognition. Nomination calls are sent out quarterly, and recipients are gifted a certificate, 2 dining hall tickets, and a copy of the nomination letter.

2022 Green Thumb Recipients

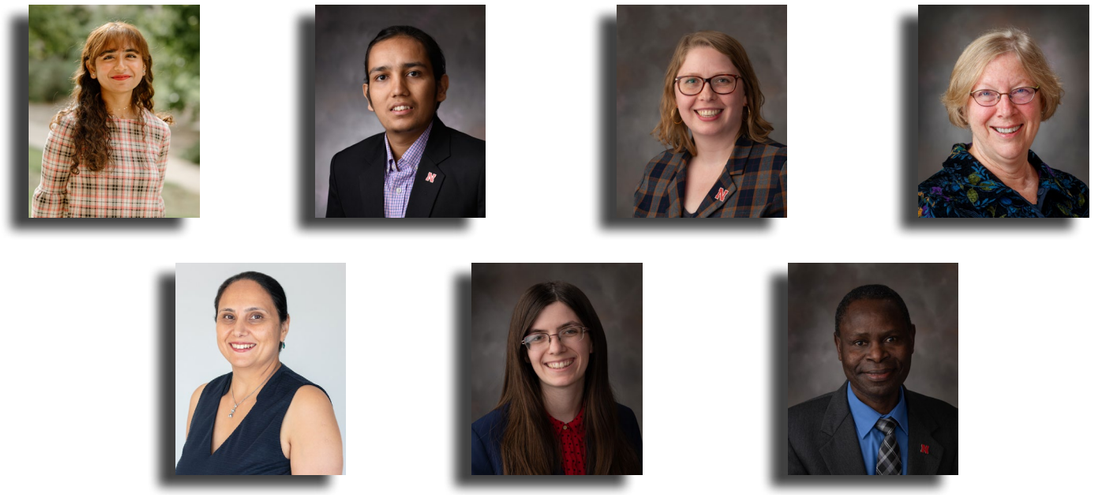
- Michael Richter, Ph.D. student, Wilson lab
- Patrick O'Neill, technologist, Funnell-Harris lab
- Julie Stevens, technologist, Wegulo lab
- Madilyn McKay, Graduate Coordinator
- Tom Powers, Professor
- MyMy Luu, Office Associate

The Advisory Group released a call for the first-ever department Service Award in the fall. This award was developed to recognize someone who has provided service beyond that required by their current positon and goes above and beyond to provide a positive environment to encourage the growth of those around them. The Advisory Group encourages all faculty, staff, and students to continue nominating their peers and mentors for these quarterly and annual awards.

Throughout the year, the Advisory Group organized trainings and presentations on DEI topics including Ouch! training on stereotypes and biases provided by the UNL Office of Diversity and Inclusion, and managing anxiety hosted by UNL's Counseling and Psychological Services. In September, the group organized a Women in STEM panel with Dr. Brandi Sigmon from Plant Pathology, Dr. Kimberly Stanke from 4-H Youth Development and Statistics, Dr. Marianna Burks from the School of Biological Sciences, and moderated by Courtesy Professor and Advisory Group member Dr. Jeewan Jyot of NUtech Ventures. Panelists shared their unique DEI journeys and how they make their classrooms and labs more inclusive and accessible.

As the group celebrated one year of activity in November, Kathy LaTourrette's term as student representative came to a close. While the group thanked Kathy for her hard work, dedication, and creative ideas, they welcomed new student representatives Mahnoor Asif and Nawaraj Dulal. The inaugural faculty and staff continued serving their 2-year term. In the fall of 2023, the department will be looking for new faculty, staff, and student representatives to join the Advisory Group and continue supporting DEI efforts.

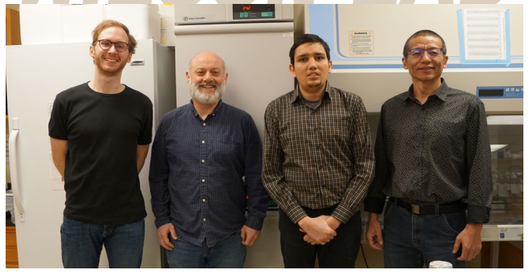
The Advisory Group welcomes all faculty, staff, and students to come to them at any time with concerns, questions, and ideas. Together, we are all working towards a more inclusive, equitable environment where we celebrate our differences and feel valued and supported within our Plant Pathology community.



Members of the Inclusive Excellence Advisory Group (top row, left to right): Mahnoor Asif, Nawaraj Dulal, Amber Hadenfeldt, Becky Higgins, (bottom row, left to right): Dr. Jeewan Jyot, Katherine LaTourrette, Dr. Stephen Wegulo

2022 was an exciting year! Read on to learn about what was happening in our labs over the last 12 months.

WILSON LAB



Wilson lab members (left to right): Michael Richter (Ph.D. student), Dr. Rich Wilson, Nawaraj Dulal (Ph.D. student), and Dr. Gang Li (Research Asst. Prof.)

In 2022, the lab continued to make progress in our understanding of plant-fungal molecular interactions. This included disseminating findings in publications and at local and international meetings. In July 2022, Dr. Wilson was an invited speaker at the Gordon Research Conference on Cellular and Molecular Fungal Biology in Holderness, NH, where he was also nominated as a co-chair for one of the future meetings. Wilson was an invited seminar speaker at the University of Wisconsin-Madison and at the University of Massachusetts – Amherst. He was also an invited plenary speaker (although he could not attend) at the International Symposium on Plant Protection focused on "Plant Biotic Interactions and Plant Health" in Huazhong Agricultural University (HZAU), China. In March 2022, Wilson organized and co-chaired the one-day Magnafest workshop at Asilomar, CA, where he also presented the lab's recent findings. Graduate student Nawaraj Dulal presented the lab's work at the North Central APS meeting held in Lincoln, NE, in June. Michael Richter presented his work in the Complex Biosystems Seminar program.

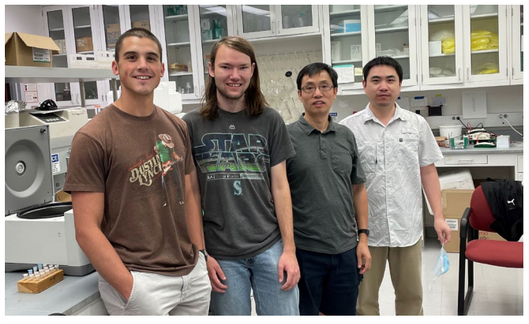
This year, the lab was awarded a three-year NSF-PBI grant totaling $750,000. This allows us to continue our molecular and cellular investigations into the nature and regulation of the rice plant-blast fungus interface. In recognition of our previous insights into the rice-fungus interaction, Wilson was elected as a Fellow of the American Association for the Advancement of Science (class of 2022).

Ziwen Gong left the lab, but we were joined by two new undergraduates, Grady Dalton, a FYRE student, and Josh Giesler, a potential UCARE student.

At UNL, Dr. Wilson was the nominated and elected chair of the ARD Advisory Council. He was a member of the ARD Advisory Council subcommittee for the 2022 Junior Faculty Recognition for Excellence in Research Award. He chaired a search committee resulting in two new faculty hires in the MPMI field, an exciting prospect for the department. Wilson was nominated and selected from an applicant pool to participate in the 2022 Research Leaders Program at UNL.

ZENG LAB

The Zeng laboratory continued to elucidate key molecular mechanisms underlying plant immunity against biotic stresses in 2022. Employing a combination of techniques in genetics, molecular biology, biochemistry, cell biology, plant pathology, and genomics, we revealed that an endomembrane-associated RING-type E3 ubiquitin ligase modulates plant patter-triggered immunity by targeting two subunits of the endosomal sorting complex required for transport (ESCRT)-I complex with distinctive ubiquitin chains. The ESCRT machinery is conserved from yeast to humans. Malfunction of the ESCRT apparatus has been shown to be associated with various cancers and neurodegeneration diseases. A manuscript based on the project was submitted and is currently under external review by *Science Advances*, a member of the Science family of journals to which only ~ 20% of manuscripts received are sent out for external review. We also published an article at *Frontiers in Microbiology* and completed experiments suggested by the editor of *Plant Cell* for a manuscript that we submitted in 2021. The new results are now being included in the manuscript for re-submission, in which a novel finding that plants possess dual ubiquitin E1 activation systems with differential roles in plant immunity is to be presented.



Zeng lab members (left to right): Mitch Hockbein (M.S. student), Daniel Bacher (undergrad), Dr. Lirong Zeng, Dr. Chaofeng Wang (post-doc).

In 2022, Dr. Zeng became an editorial board member of *Plants* and was invited to become Associate Editor of *Frontiers in Plant Science* in the Plant-Pathogen Interactions section. He was also appointed to the NSF-USDA joined PBI Program Proposals Review Panel, contributing to joined efforts that evaluated over 40 proposals. Two graduate students supervised by Dr. Zeng moved to the next stage of their career development this year. Mitchell Hockbein, a Master student in our lab, completed research experiments for his thesis and landed an industry job at the Corteva company in November. Samuel Eastman, a Ph.D. student whom Dr. Zeng was on his Graduate Advisory Committee, graduated in May and joined a lab at Princeton University as a postdoctoral associate in July.

SIGMON LAB

Above: Kyle Linders (M.S. student) measures chlorophyll content in maize hybrids grown using different nitrogen treatments in Scottsbluff, NE during the summer of 2022.

Research in the Sigmon lab focuses on a variety of different projects involving molecular biology, genetics, development and/or phenotyping in both maize and sorghum. Masters student, Kyle Linders, completed phenotyping the Sorghum Association Panel for a variety of different panicle and biomass-related traits under different nitrogen treatments. He is currently conducting Genome-wide Association Studies to identify regions in the genome associated with differences in nitrogen response. Microbiology undergraduate student, Alice Guo, completed work on her honors thesis project, which focused on investigating gene expression patterns in maize lines that are resilient to nitrogen stress. She plans to graduate spring 2023 and attend dental school at UNMC. Claire Snodgrass, also an undergraduate Microbiology student, began working on a project focused on studying CRISPR-Cas9 knockout lines of

previously identified inflorescence candidate genes in sorghum and maize. Before leaving for graduate school in Arizona, Clay Christenson continued to work on developing an image analysis and feature extraction pipeline for high-throughput phenotyping of maize ears. Olivier N. Mizero, a recent graduate of UNL and CUSP scholar, has now taken over this project. The lab also hosted a talented high school intern, Camila Gomez, during the summer of 2022. She helped Kyle complete the sorghum panicle phenotyping and shadowed Alice in the lab. We look forward to Camila's very bright future!

WEGULO LAB

Wegulo lab members (left to right): Alex Roush (undergrad student worker), Bella Devny (undergrad student worker), Meryl Sahouet (undergraduate student worker), Julie Stevens (Research Technologist), Dr. Stephen Wegulo, Mahnoor Asif (Ph.D. student).

The Wegulo Lab studies the epidemiology and integrated management of Fusarium head blight (FHB), a devastating disease of wheat and other small grain cereals caused mainly by *Fusarium graminearum*. Wheat and barley lines in the UNL small grains breeding program are screened for resistance to FHB, stem rust, and leaf rust. Field trials are conducted to evaluate the efficacy of fungicides in controlling head and foliar fungal diseases of wheat including FHB, leaf spots, and rusts. Extension activities include the development and delivery of clientele-targeted educational materials, participation in crop production clinics and field days, and annual wheat disease surveys. In the fall of 2021, Mahnoor Asif joined the lab as a Ph.D. student working on FHB and foliar fungal diseases of wheat. Her research aims to evaluate the effects of cultivar resistance and the timing of fungicide applications on these diseases. She completed her first season of field work in 2022 and is in the process of analyzing the data. She is also evaluating the sensitivity of Nebraska isolates of *F. graminearum* and *F. boothii* to one of the triazole fungicides used to control FHB in Nebraska during the last 10 to 15 years. In addition, in greenhouse experiments, she will be determining the effects of repeated fungicide exposure on the aggressiveness and deoxynivalenol production of *F. graminearum* and *F. boothii*. After at least two seasons of field work, she will quantify the economic benefits of fungicide applications and their timing to manage FHB and foliar fungal diseases of wheat. The lab is managed by research technologist Julie Stevens and is assisted by several student workers each year.

YUEN LAB

Dr. Gary Yuen will retire on March 1, 2023, exactly 34 years since he joined the department. In his last year on the faculty, he closed several research projects, co-authoring four journal publications relating to pathogens of Nebraska crops. One paper published in Crop Protection featured research conducted by Katie Bathke, an undergraduate student in his lab, and highlighted the novel use of biological seed treatment to control bacterial leaf streak in corn. As in past years,

Mischell Craig (left) and Dr. Gary Yuen (right)

2022 LAB HIGHLIGHTS

Gary also taught classes in the Spring, Summer, and Fall semesters of 2022, providing instruction in general plant pathology and biological control to nearly 100 undergraduate and graduate students.

Dr. Gary Yuen (center) with his first (Mischell Craig, left) and last (Christy Jochum, right) technologists!

Gary gratefully acknowledges the contributions of three department members who were involved in the beginning and the end of his research program. Mischell Craig, a UNL graduate in Animal Science, started as Gary's first Research Technologist in 1989. Christy Jochum, who previously worked as an undergraduate student with Max Schuster on the Goss's wilt pathogen, assumed the Research Technologist position in 1998 until her retirement in 2020. Both Mischell and Christy played critical roles in managing the Yuen lab and leading his field research. He is also indebted to them for "keeping me from getting lost in the field and for cleaning up my mess in the lab".

Loren Giesler, now department head, was Gary's first Ph.D. student. As a student, Loren found the bacterium Lysobacter to be effective in the biological control of fungal pathogens. This discovery spawned further research in the Yuen lab, as well as in other labs worldwide, on the use of Lysobacter as a biological control agent or as a source of novel antimicrobial compounds. Gary is also glad that he followed his own advice when he advised Loren: "Be kind to your grad student because one day they could be your boss".

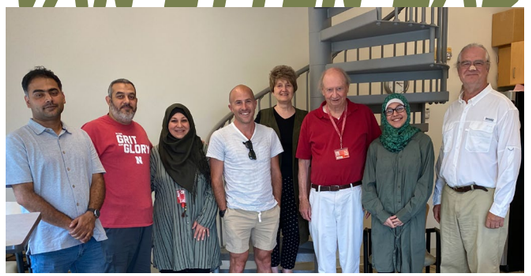
Above: Dr. Loren Giesler (left) and Dr. Gary Yuen (right) working in the greenhouse together.

POWERS LAB

We welcomed a new Ph.D. student, David Kihoro Sirengo to the program. David is a citizen of Kenya and comes with experience working with Potato Cyst Nematode, a globally destructive nematode parasite. Former students Dr. Julianne Matczyszyn and Abigail Borgmeier both published papers from their graduate work in 2022. Julianne is now working at a cancer lab in Boys Town hospital and Abigail embarked to Antarctica in December 2022 to explore nematode diversity in extreme environments. We have continued to explore Nebraska's extreme habitats in the western Sandhills Alkaline Lakes. Together with our University of Florida colleagues, a paper was published in Molecular Ecology describing the unique nematode communities, some of which exist in lakes with pH values exceeding 10.0. Dr. Peter Mullin is leading a team examining the use of nematodes as environmental indicators by studying the impact of pesticide contamination at the former AltEN ethanol production facility outside Mead, Nebraska. We have a new First

Year Research Experience (FYRE) student Naidaly Gonzalez Miranda joining Peter on the project. Abigail, David, Kris Powers, and Tom Powers presented their research in May at the International Congress of Nematology Societies in Antibes, France. Kris presented results of the novel nematode-algal virus interactions, a collaboration with Dr. David Dunigan and Dr. James Van Etten's chlorella virus team. Becky Higgins will be displaying our lab's artistic side with an art show on nematode diversity in prairie grasslands at the Wallspace Gallery in September 2023.

VAN ETTEN LAB

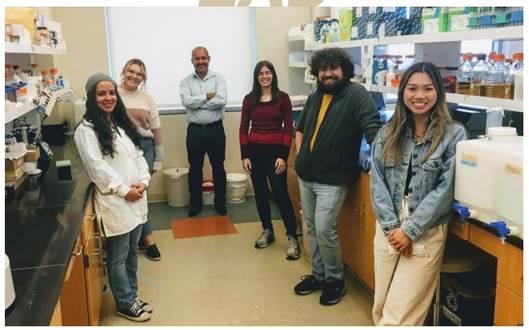


Van Etten lab members (left to right): Dr. Jayadri Ghosh (post-doc), Dr. Maitham Al-Sammak (technician), Dr. Zeina Al-Ameeli (technician), Eric Noel (Ph.D. student), Dr. Irina Agarkova (Research Asst. Prof), Dr. Jim Van Etten, Fatima Al-Sammak (volunteer), Dr. Dave Dunigan (Research Asst. Prof.).

The Van Etten laboratory continues to work on a range of topics associated with the molecular biology, biochemistry, physiology, ecology, genetics, and bioinformatics of viruses that infect certain unicellular, eukaryotic chlorella-like green algae. Chloroviruses are found in freshwater all over the world and they have many interesting and unexpected properties. One property is that the chloroviruses are among the largest viruses known, containing as many as 16 tRNA-encoding genes and 400 protein-encoding genes, including many not previously reported in viruses. These genes encode DNA restriction and modification enzymes, hyaluronan and chitin biosynthetic enzymes, polyamine biosynthetic enzymes, ion channels and transporters, and many glycosyltransferases. The proteins encoded by some of the chloroviruses are either the smallest or among the smallest proteins of their class. Consequently, some of the chlorovirus-encoded proteins are the subject of intensive biochemical and structural investigation. Currently there are almost 500 publications on the chloroviruses and their gene products. In the past year, our lab published six manuscripts and three more are in press on the viruses. This year's publications were in *J. Virology, Glycobiology, Frontiers in Neurology, Nature Reviews Microbiology, Chemical Reviews, and Nature Communication*. We currently have active projects with collaborators at the University of Nebraska Medical Center, Purdue University, University of Texas El Paso, three Universities in Italy (Milano, Genova & Naples), Germany (Darmstadt), France (Aix-Marseille University), Spain (University of the Basque Country), China (Sun Yat-sen University) and Brazil (Federal University of Minas Gerais). Our recent work on the ecology of the chloroviruses with John DeLong (School of Biological Sciences at UNL) has led to the exciting finding that the chloroviruses can serve as a food source for certain protists. That means that viruses need to be considered as part of the food chain. The first paper describing this significant finding was just published in the first edition of the 2023 *Proc. Natl. Acad. Sci.* We currently have a NSF-EPSCoR-funded project with the University of Delaware, University of Hawaii, and Roger Williams University (Rhode Island) that involves looking for chloroviruses in the unique alkaline lakes located in western Nebraska. There are only two other places in the world that have lakes similar to the ones in Nebraska.

2022 LAB HIGHLIGHTS

GARCIA-RUIZ LAB



Garcia-Ruiz lab members (left to right): Rosalba Rodriguez-Peña (Ph.D. student), Erica Schufeldt (undergrad student worker), Dr. Hernan Garcia-Ruiz, Katherine LaTourrette (Ph.D. student), Eric Parperides (Ph.D. student), and Katie Tran (undergrad student worker).

Gene silencing is a critical determinant of plant-microbe interactions. Research in our lab is focused on the basic mechanisms of plant-virus interactions, specifically antiviral gene silencing, induction and suppression of gene silencing by plant pathogens, and viral genomics. Current projects focus on the early steps leading to gene silencing initiation, identification and characterization of susceptibility genes to plant viruses, and cellular siRNAs as determinants of defense responses. We implement an interdisciplinary approach that combines biochemical, genetic, genomic, and bioinformatic tools. We use experimental model systems that consist of positive- and negative-strand RNA viruses and model plants *Arabidopsis thaliana* and *Nicotiana benthamiana*, and the heterologous host *Saccharomyces cerevisiae*. We are particularly interested in the mechanisms of Maize Lethal Necrosis and genomic variation in viruses. We have identified several silencing suppressors from viruses implicated in Maize Lethal Necrosis, and hypervariable regions in the genome of potyviruses, poleroviruses, orthotospoviruses, and betacoronaviruses. Hypervariable areas in viral genomes mediate adaptation to hosts and vectors without compromising functionality. The computational approach developed is a fundamental tool for profiling viruses of agricultural importance. Our findings have an immense impact on agriculture, such as molecular diagnostics and engineering of genetic resistance to viral diseases in plants. Our lab is housed at the Morrison Life Science Research Center and is part of the Nebraska Center for Virology. For more information visit: https://plantvirology.unl.edu/

MITRA LAB

Mitra lab members (left to right): Dr. Hasan Pinar (visiting scholar), Dr. Mahmut Kaplan (visiting scholar), Serkan Tokgoz (Ph.D. student), and Dr. Inanc Soylu (visiting scholar).

Mitra lab research is focused on developing disease resistant transgenic and gene-edited potato, tomato, and bean plants. Their efforts include use of multi-domain antimicrobial peptides, R gene remodeling, and RNA interference approaches for resistance against zebra chip disease in potato and several viral and bacterial diseases of tomato. Graduate student Serkan is trying very hard to make up lost time and graduate by summer 2023.

GARCIA-AROCA LAB

Garcia-Aroca lab members, left to right: Dr. Teddy Garcia-Aroca, Elizabeth Chhoeung (undergrad student worker), Xin Zhi Khoo (M.S. student). Not pictured: Karissa Rieck (undergrad student worker).

The Fungal Ecology Lab in the Department of Plant Pathology at UNL opened its doors in the Fall of 2022. Research in our lab is focused on understanding the drivers of evolution and diversity in populations of fungal plant pathogens across ecosystems in Nebraska, the region, and at the global scale. One the of main questions we aim to address in our research is: what factors limit the distribution of these pathogens in agricultural and non-agricultural ecosystems, and what are the implications for their microenvironment? Elucidating variations in pathogen populations, evolutionary history, and factors that limit their distribution can potentially lead to discoveries that are useful for development of long-term management strategies.

The focus of our research are fungal plant pathogens associated with important crop diseases in Nebraska and North America. However, given the ecological interactions across pathogens and other microorganisms, and host/non-host plant species, we are seeking collaborations across the board to address variations in pathogen ecology from plant, animal, and human ecosystems, and across wider geographical areas at the regional, national, and global scales.

About our people: Xin Khoo is starting her M.S. program and her research will include some of the aspects mentioned here, but since she is the first student in our lab, she has the opportunity to study pathogens and ecosystems that she finds interesting. Xin has a background in Agronomy and finds most plant pathogens fascinating. Elizabeth Chhoeung is in her freshman year and started working in our lab quite recently, but she has quickly become part of our family. She has broad interests including microbiology and bioinformatics. She will provide some support on research projects focused on Fusarium spp. Karissa Rieck is also in her freshman year and joined our lab in the Fall of 2022. She has provided assistance with reviving historical specimens of Rhizoctonia spp. and isolating pathogens from infected soybean leaves/roots. Karissa is also interested in microbiology and aims to perform cancer research in the future. Dr. Teddy Garcia-Aroca is currently focusing on establishing our research program in the Fungal Ecology Lab, building preliminary data for grant proposals, and pushing through manuscripts from previous work. In the Spring of 2023, Teddy is teaching one undergraduate-level course, PLPT 210 Plant Pathogens and Disease, for 81 undergrads and co-teaching a graduate-level course, PLPT 802 Ecology and Management of Plant Pathogens, for 13 students.

HARVESON LAB

Dr. Bob Harveson is an Extension Plant Pathologist at the Panhandle Research and Extension Center in Scottsbluff, NE. His current appointment involves 50% research and 50% extension, with statewide programming responsibility for specialty crop diseases. His research program focuses on the etiology and applied management of root rot diseases of sugar beets, bacterial diseases of dry beans, and sunflower diseases utilizing the integration of biological, cultural, chemical, and predictive methods. He has conducted additional projects involving several new pulse crops (chickpeas, cowpeas, and dry yellow peas) as well as potatoes, corn, chicory, and wheat.

The plant pathology program has employed

Dr. Bob Harveson in his home library.

field disease surveys and disease diagnostics as cornerstones to establish an extension and research program. The diagnostic lab at Scottsbluff has processed more than 28,000 total (plant and soil) samples since the fall of 1999. This service has created new publications, generated partial income for technical support, and identified and highlighted important problems, while also providing preliminary data for new proposals that attempt to address these issues with applied research. This service has additionally resulted in more than 25 reports on the occurrence of new diseases.

Two of the most recent and unusual projects include the results of a 10-year study focusing on a new virus disease of sunflowers never before known to science. We published this information in 2022 as a Plant Disease Feature and also proposed a name for the new pathogen (Sunflower ring spot mottle virus). The second project was a collaborative effort with a group of microbiologists from Florida and Georgia. It consisted of the identification and characterization of bacterial wilt isolates (*Curtobacterium flaccumfaciens* pv. *flaccumfaciens*) originally acquired from the stratosphere.

JACKSON-ZIEMS LAB

Jackson-Ziems lab members (left to right): Brad Tharnish (technologist), Talon Mues (technologist and M.S. student), Asha Mane (Ph.D. student), Dr. Tamra Jackson-Ziems, Chikoti Mukuma (Ph.D. student), and Chris Termunde (M.S. student).

Our lab has undergone several changes over the last year. In July 2022 we welcomed a new technician, Talon Mues, to the lab! Talon is assisting technologist Brad Tharnish in leading our field testing program while pursuing his M.S. degree with our lab group.

Graduate student Asha Mane, co-advised with Dr. Sydney Everhart, has been busy with her research and is gaining recognition for her work! Asha's results have confirmed widespread fungicide resistance in the frogeye leaf spot pathogen of soybean in Nebraska and her follow-up fungicide survey results are helping us to better understand how application decisions are made by stakeholders.

We're also excited to welcome new graduate students to our lab team:

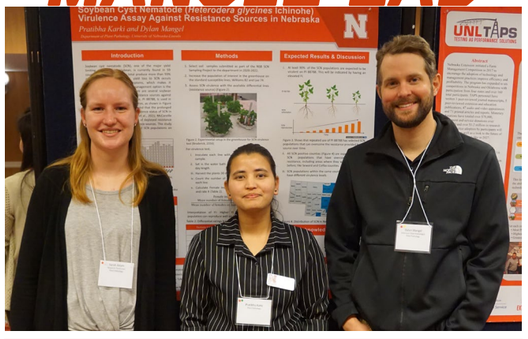
- Chikoti Mukuma has joined our lab group from his home country of Zambia. He is a graduate from our department having earned his M.S. with Dr. James Steadman in 2016 and has returned to Nebraska to pursue his Ph.D. degree.

- Chris Termunde (and his wife Claudia) moved to Nebraska from Georgia so he could pursue graduate school as part of our team. He recently completed his B.S. at Abraham Baldwin Agricultural College and is working toward his M.S.

Both Chikoti and Chris are working on crown rot, an emerging disease of corn that has become increasingly common and captured the attention of growers and industry in the U.S. Corn Belt.

Tamra continues on a busy Extension program schedule that is still recovering from the pandemic and now has more teaching responsibilities. The online mini-course, Corn Diseases, has moved from the Special Topics space and now has its own course number and will be offered every spring. The PLPT 891 Plant Diseases Across Nebraska tour course returned for 2022 in June and we had a great time traveling to several places throughout north and central Nebraska, giving students the opportunity to see much more of our state and the plant production systems here.

MANGEL LAB



Mangel Lab members (left to right): Sarah Adam (technician), Pratibha Karki (M.S. student), and Dr. Dylan Mangel.

As we close out our first year as a lab, we have much to be proud of. April marked the start of our lab and we have been busy ever since. In July, we hired Sarah Adam as a technician and in August, we welcomed Pratibha Karki as a master's student.

Pratibha Karki and Sarah Adam harvesting soybean research plots at Haskell Ag Lab near Concord, NE.

Over the summer, we managed fourteen field plots across three research farm locations and four field day sites. Our work included product validation in disease nurseries and management demonstrations for farmers around the state. Pratibha began working on soybean cyst nematode research and presented her first poster in December. This was another first for our lab, and we are excited to see her progress in the coming year. Becky Higgins has also been a valuable member of our team, focusing on regulatory compliance and helping us organize our isolate collections.

As we look ahead to the new year, we are excited to continue fostering strong relationships with Nebraska farmers. Our upcoming projects focus on providing innovative and effective disease management options for the state. We are also excited to expand our collaborations within our department and with other departments to drive further advancements in our field.

Overall, 2022 has been a year filled with firsts for our lab, but we feel well-positioned for growth and success in 2023.

FUNNELL-HARRIS LAB

Funnell-Harris lab members, left to right: Kate Berzonsky (undergrad student worker), Ashley Parde (biological science aid), Shiv Singla (M.S. student), Pat O'Neill (technologist), and Dr. Deanna Funnell-Harris.

The Funnell-Harris lab is focused on describing interactions of fungal pathogens with specific sorghum and wheat host genotypes, especially those with altered lignin and pigment compositions and concentrations. Sorghum stalk rot pathogens are destructive and impact both grain and biomass yields. Many different fungi inhabit stalks without causing disease, but then various stresses such as drought trigger development of stalk diseases. Fusarium stalk rot and charcoal rot result in significant losses of sorghum biomass in the U.S. They can cause plant lodging and impair biomass and grain harvest and are particularly insidious when water is limited, especially around the time of flowering. We developed a method to simulate reduced water conditions in a greenhouse. Using this technique, we screen sorghum lines altered in lignin synthesis for resistance to pathogens and drought. Lignin is associated with disease resistance. Compounds related to lignin synthesis can have antifungal properties, so their accumulation may slow disease progression. Grain mold disease, which reduces sorghum grain quality, is caused by a complex of diverse fungal pathogens. We examine the role pigments that are deposited in the outer layers of the grain play in resistance to mold diseases. Tannins impart bird resistance due to their bitter taste. We are screening lines where tannins are present or absent in the grain to determine whether tannins can reduce grain molds. We are comparing the fungi inhabiting outer layers of the grain, where tannins and pigments are deposited, versus those in the starch-rich inner endosperm. Our M.S. student Shiv Singla uses wheat lines with modified lignin synthesis to identify genes and pathways conferring resistance to Fusarium head blight (FHB). After screening these lines for resistance to FHB, he is performing transcriptomic and metabolomic studies to identify potential mechanisms behind the resistance. Findings from Shiv's research can provide information for breeders to develop FHB-resistant wheat varieties in the future.

TATINENI LAB

The main focus of Dr. Tatineni's lab research is virus-virus, virus-host, and virus-vector interactions of economically important wheat streak mosaic virus (WSMV), Triticum mosaic virus (TriMV), and High Plains wheat mosaic virus. Since these three viruses are transmitted by a common vector, wheat curl mite, mixed infection of wheat with two or three viruses is common in growers' fields with exacerbated yield loss. Dr. Tatineni's lab is working to understand how these viruses cause disease in wheat and identify the host and vector factors required for completion of the virus infection cycle and use this information to disrupt the virus infection cycle through biotechnological

approaches such as RNA-interference and gene editing. To achieve these goals, Dr. Tatineni and his team are examining viral gene functions through reverse genetics and biochemical and molecular biology approaches and identifying host and viral factors through protein-protein and protein-RNA interaction and bioinformatics studies.

Tatineni lab members: (Front row L to R): Emily Rasmussen (undergrad student worker), Haritha Nunna (Ph.D student), and Dr. Tatineni. (Back row L to R): Jeff Alexander (Ph.D. student), Sourav Pal (Ph.D. student), and Emma Sidel (undergrad student worker).

The availability of GFP- or RFP-tagged WSMV and TriMV facilitated the examination of viral genes required for movement, disease development, superinfection exclusion (SIE), synergistic interaction, and mechanisms of Wsm1 and Wsm2 gene resistance in wheat cultivars against WSMV and TriMV. Dr. Tatineni's lab developed RNAi-based dual resistant transgenic wheat against synergistically interacting WSMV and TriMV. Dr. Tatineni and his team are working on: (1) mechanisms of SIE of WSMV and synergistic interaction between WSMV and TriMV; (2) virus-host interactions of WSMV to identify means of disruption and control of viral diseases; (3) virus-vector interactions between WSMV and wheat curl mites to identify ways to interrupt vector transmission; and (4) develop and characterize transgenic wheat for resistance to WSMV and TriMV and pyramid transgenes with natural resistance genes.

2022 DEPARTMENT PROGRAM REVIEW

Universities vary in their approach to department academic program reviews. At UNL, we are fortunate to have an administration that values them. Reviews are completed every 6-7 years by a team including 3 external experts in our field, a graduate student, IANR faculty member representatives, and a UNL Academic Program Committee (APC) member.

Our APR team included Drs. Lindsey du Toit (Washington State Univ.), Ron Walcott (Univ. of GA), and Marty Draper (Kansas State Univ.). Our graduate student representative was Kathrine LaTourrette (a Complex Biosystems student in our department). Joe Louis (Entomology Dept.) was our IANR faculty representative, and Anna Hiatt was our APC representative. This review occurred at a key time in our trajectory as we started our new graduate program in 2020 and we have 4 new faculty starting careers in our department. One key goal of the review was to get feedback on our Graduate Program to inform future direction and development.

As a result of the APR and the team recommendations, we are moving ahead with a full graduate program curriculum review and redesign. We are also redesigning our graduate student evaluation process, developing a stakeholder advisory board, and have increased awareness of staff resources for professional development. We thank our APR team for providing a thorough review and investing in our future!

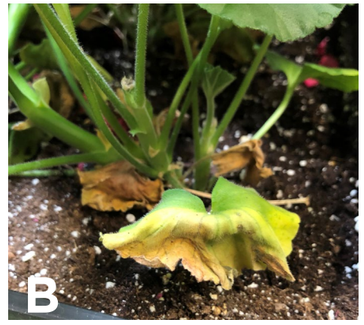
APR Team: Lindsey du Toit, Katherine LaTourrette, Marty Draper, Ron Walcott, Joe Louis, and Anna Hiatt

UPDATES FROM THE PLANT & PEST DIAGNOSTIC CLINIC

P&PDC Coordinator, Kyle Broderick

"My trees are dying!" seemed to be the song of 2022 in the Plant & Pest Diagnostic Clinic (P&PDC). The extreme drought through late summer and fall of 2021 and lack of precipitation in the winter of 2021/2022 resulted in an inordinate number of questions about previously healthy trees that seemed to turn brown and die suddenly. This was most common on evergreens, but many woody perennials in the landscape suffered this same fate.

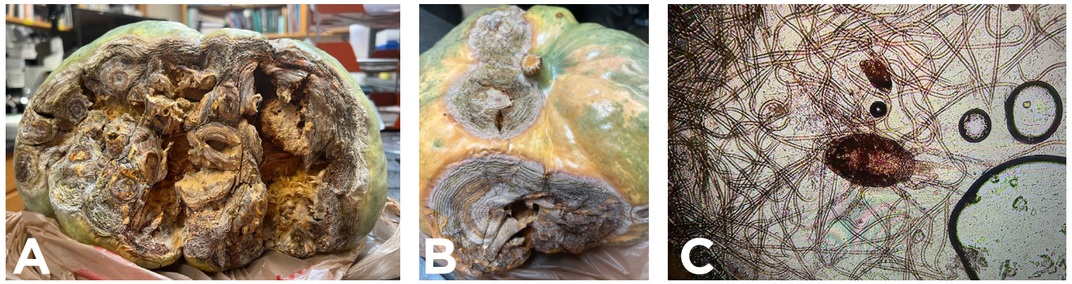
2022 was another busy year in the Clinic as we received 1,150 unique samples from six states. As is often the case, corn and soybeans dominated the samples, receiving 244 and 127 unique samples respectively. The P&PDC coordinator continued to serve as the pathologist for the Nebraska Department of Agriculture (NDA) and nearly 20% of the samples were a part of NDA greenhouse, nursery, and field inspections. Fortunately, there were no major diseases identified that resulted in regulatory action. Aside from the agronomic and NDA samples, we also received samples from golf courses, vineyards, organic vegetable producers, and commercial greenhouses.



Bacterial blight of geranium (*Xanthomonas campestris* pv. *pelargonii*) was widespread early in 2022. Common symptoms include water-soaked leaf spots and chlorosis (**A**) and wilting of one or more leaves (**B**) despite a healthy root system.

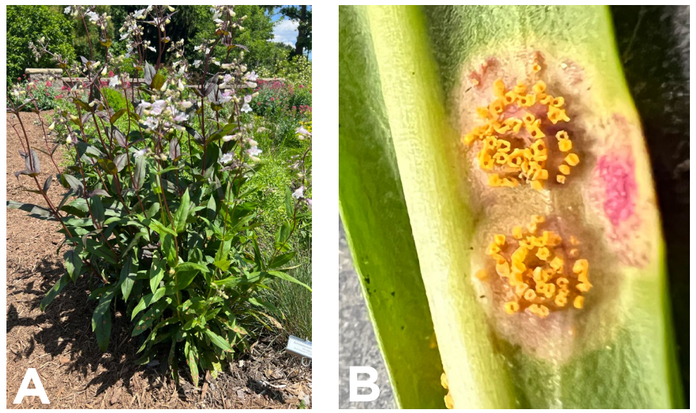
One of the largest issues encountered in early 2022 was the spread of bacterial blight of geranium, caused by the *Xanthomonas campestris* pv. *pelargonii* (above). There was widespread disease due to one of the largest international wholesalers of geranium cuttings inadvertently shipping infected plant material. The P&PDC confirmed this disease in 5 different greenhouses in Nebraska and Iowa. Though this disease did not require any regulatory action, thousands of infected plants were destroyed. The most exciting sample was Fusarium rot of pumpkin (next page), which arrived just in time for Halloween.

CONTINUED UPDATES FROM THE PLANT & PEST DIAGNOSTIC CLINIC



Fusarium rot of pumpkin (*Fusarium solani* f.sp *cucurbitae*) hit a large commercial pumpkin field in eastern Nebraska. The fruit rot (**A**) forms firm, sunken lesions that may occur in concentric rings (**B**). This sample was also overrun with secondary fungal feeding nematodes and mites (**C**)

We continued to monitor the spread of tar spot spread across corn fields in the eastern one-third of Nebraska. This disease has been confirmed in over 30 Nebraska counties, though it is likely in more. In addition to common foliar diseases such as southern rust, bacterial leaf streak, and gray leaf spot, Fusarium crown and stalk rot was again problematic in many fields. The P&PDC also saw an increase in viral diseases, which was likely driven by the movement of insect vectors out of the dry, grassy ditches and into the lush, irrigated fields.



Penstamon rust (*Puccinia pentstamonis*) was very common on the cultivar 'Dark Tower'. Symptoms begin in the lower canopy (**A**) and progress up the plant. Uredinia are produced on the underside of the leaves (**B**).

The increase in attention to landscapes and gardening continued, increasing the number of homeowner samples submitted to the P&PDC. Abiotic problems, primarily drought, were responsible for most of the plant problems in 2022, but there were also some fun fungal diseases as well. Timely rains in the early summer allowed Penstamon rust (*Puccinia penstemonis*) to be widespread on susceptible cultivars (above).

Another aspect of the Clinic's return to normalcy meant the return of our educational booths at the Lincoln Haymarket Farmer's Market (right). With the help of the Plant Pathology Graduate Student Association we were able to connect with many urban clients who were previously unaware of the P&PDC. We were also involved in the UNL Discovery Days, an educational event hosted on campus. While similar to the Farmer's Market outreach events, the Discovery Days had more of a youth focus. These outreach events are very popular with the public and provide a great opportunity for graduate students to learn more about the work of UNL Extension.

One of the biggest changes to the P&PDC was the departure of our not-so-long-time office associate, MyMy Luu. For just under 2 years, MyMy kept the P&PDC running and we wish her the best in her position as a payroll coordinator with the College of Engineering.

Graduate students Michael Richter and Asha Mane show visitors Anthracnose on an oak leaf at the Haymarket Farmer's Market in Lincoln, NE.

GRADUATES

Samuel Eastman
Ph.D. graduate, August 2022
Advisor: Dr. Ming Guo

Rosalba Rodriguez-Peña
Ph.D. graduate, August 2022
Advisor: Dr. Hernan Garcia-Ruiz

- **Samuel Eastman** moved to New Jersey and is currently working as a post-doctoral research associate at Princeton University in the lab of Dr. Jonathan Conway.
- **Rosalba Rodriguez-Peña** moved back to her home country, the Dominican Republic and is currently employed at a university as a faculty member.

Congratulations to our 2022 Plant Pathology Graduates!

PLANT PATHOLOGY AWARDS

In the Department of Plant Pathology, we have department-specific awards that are distributed yearly. These awards are the Goss Memorial Scholarship and PPGSA Professional Development Award for students and the Lambrecht Award for technologists.

The Goss Memorial Scholarship was developed to help defray expenses for students who are presenting research at regional and national/international meetings, attending and participating in relevant workshops, or any other appropriate scholarly activity beyond the normal execution of their research. In 2022, we had 7 recipients of the Goss Memorial Scholarship: Katherine LaTourrette, Asha Mane, Chris Termunde, Chikoti Mukuma, Michael Richter, Shiv Singla, and Mitch Hockbein.

The PPGSA Professional Development Award was established in 2020 and is meant to be used as financial assistance to travel to scientific meetings or attend workshops and training events. In 2022, there were 6 recipients of the award: Mahnoor Asif, Nawaraj Dulal, Katherine LaTourrette, Eric Parperides, Michael Richter, and Shiv Singla.

The Lambrecht Award for Technologists recognizes the contributions of technologist Patricia Lambrecht to the science of plant pathology, the laboratory of Dr. Anne Vidaver and others, and assistance to the department in mentoring students, technicians, and post-docs in various techniques and practices in plant pathology, especially those connected with bacterial plant pathogens. The award is primarily for the furtherance of the awardee's education, attendance at conferences and meetings, travel to meetings and experimental sites, or other activities. In 2022, the recipient of the Lambrecht Award was Brad Tharnish, technologist with Dr. Tamra Jackson-Ziems.

Congratulations to all recipients of awards and scholarships in 2022!

2022 APS NORTH CENTRAL DIVISION MEETING

In June, our department had the privilege of hosting the 2022 APS North Central Division Annual Meeting with over 130 registered attendees. The meeting was held at the Graduate Hotel in Lincoln and was a jam-packed 2 days full of scientific workshops and presentations as well as plenty of time to network with other plant pathologists in various industries. The first of many socials came the night before the conference began, where everyone was able to enjoy a beautiful summer evening on a private patio at the Graduate.

The first day of the meeting included five workshops: Careers 101 panel, Challenges and Opportunities in Plant Health Education: Building Sustainable Teaching Networks, Microscopic Adventures: A Hands-on Dive into the Nematode Species of the Corn/Soybean Soil Community, Introduction to Python for Plant Pathologists and Introduction to R for Plant Pathologists. This day was rounded out by a welcome social in the evening and a separate graduate student social at a nearby brewery. On the second day, there were a total of 54 abstracts presented on all aspects of plant pathology. Out of these abstracts, 20 and 22 students participated in the graduate student poster and oral presentations, respectively. Congratulations to the following winners.

Oral competition:

- 1st place: LeAnn Lux, North Dakota State Univ.; 2nd place: Jhonatan Barro, Univ. of Kentucky; 3rd place: Karthika Mohan, South Dakota State Univ.

Poster competition:

- 1st place: Matthew John, North Dakota State Univ.; 2nd place: Harkamal Kaur, North Dakota State Univ.; 3rd place: Gabe Dusek, North Dakota State Univ.

In addition to the oral and poster presentation awards, the division also distributed 17 graduate student travel awards. Three service awards were also presented:

- *Early Career Award*: Ashok Chanda, University of Minnesota
- *Distinguished Service Award*: Martin Draper, Kansas State University
- *Friend of Crop Protection Network*: Doug Jardine, Kansas State University

Hosting this meeting was made possible by our meeting organizers, including Dr. Loren Giesler, (President and Division Forum Representative of the APS-NCD), faculty, staff, and students of our department, judges and moderators for the graduate student competitions, the APS-NCD executive committee, staff at APS, and our generous event sponsors. We look forward to seeing our colleagues at Purdue University in June 2023.

The Department of Plant Pathology is on a trajectory to be a leading institution in our field of science. As we continue to grow our department, there is a consistent need to support faculty, staff, and students in ways that inspire community and strengthen relationships in order to build connections and a sense of belonging.

The Plant Pathology Department Excellence Fund has been established to provide opportunities for future students and our department community. It is critical that our students are exposed to a diverse set of experiences to help them become effective leaders. Teamwork, leadership, interpersonal skills, collaborative projects, community outreach, teaching, and communication with diverse audiences are examples of qualities we want our students to grow in by encouraging their participation in rewarding activities.

Please consider donating to this fund to ensure opportunities continue that build our community of professional plant pathologists at UNL. To make a contribution to this fund, please visit: go.unl.edu/plantpath-excellence.

University of Nebraska FOUNDATION

DEPARTMENT OF PLANT PATHOLOGY