

Grain Quality Newsletter

News and Highlights from NC-213: Marketing and Delivery of Quality Grains and BioProducts Coproducts.

Volume 40:2

NC-213: The U.S. Quality Grains Research Consortium

NC-213 Bids “Farewell” to a Long-Standing Member

As of August 1, 2020, Dr. Franklin (Frank) H. Arthur, Research Entomologist, United States Department of Agriculture (USDA), Agriculture Research Service (ARS), Manhattan, Kansas will retire. Not only has Frank Arthur been a long-standing contributor to NC-213 missions, research, and activities, but has a rich history with the USDA-ARS.



Frank’s career with ARS began in 1986 with an appointment as a Research Entomologist at the Stored Product Insects Research and Development Laboratory, Savannah, GA. He was transferred to the now Center for Grain and Animal Health Research, Manhattan, KS, upon closure of the Savannah lab in 1994.

He was responsible for planning, coordinating, and developing an independent research program on insect pest management in stored raw agricultural commodities and processed food warehouses. He cooperated with private industry by conducting laboratory and simulated field tests to determine effective application rates and residual efficacy

for conventional insecticides and microbial products that are being developed for use in post-harvest environments. Research included to identify factors that affect residual insecticide efficacy, model insecticide residual degradation and biological efficacy during storage, determine insecticide resistance in pest species, and develop methods for assessing resistance that more accurately simulate insect exposure under field conditions. Further research was to evaluate non-chemical control options for inclusion in management programs for stored products and to analyze and interpret research data, publish results, and present papers at professional meetings.

As a result of Frank’s extramural funding, he was able to secure more than \$12,000,000 as a co-PI on competitive grants, and more than \$200,000 in Industry Trust funds received directly to the research program.

During the course of Frank’s career, he has made 274 Presentations to date, 135 of those were invited presentations. Twenty presentations were as keynote speaker or session chairman at international research conferences (IWCSPP, IOBC). In addition to his presentations, he has 262 publications as senior author or co-author in refereed journals (52 in last 4 years), 34 publications in conference proceedings, and 16 book chapters.

Frank’s educational background includes his Ph.D. (1985) and M. S. (1982) in Entomology, North Carolina State University, Raleigh, North Carolina, and his B.S. (1976) in Wildlife Ecology, University of Florida, Gainesville, Florida.

Please join the NC-213 Administrative Advisor/Coordinator’s Office on wishing Frank good luck and success as he enters this phase of life!

North Dakota State University Researchers Receive Grant to Reduce Pathogens in Flour.

NDSU researchers recently received a USDA Food Safety and Defense grant to explore the use of steam pasteurization to reduce pathogens in milled flour.

Senay Simsek, NDSU's Bert L. D'Appolonia Cereal Science and Technology of Wheat Endowed Professor, and Teresa Bergholz, associate professor of microbiological sciences, will work on a project titled "Killing before milling: Utilization of Vacuum Steam Pasteurization For Controlling Enteric Pathogens On Wheat." The three-year grant totals nearly \$500,000.

Wheat is the third-most produced crop in the world, and milled flour is a central component in food products around the globe. Historically, there has been little concern for the safety of wheat flour and its related food products, as flour is low in moisture and cannot support microbial growth. However, some microbes can survive in low moisture conditions for extended periods of time.

During the growing season and harvest, wheat kernels are exposed to a variety of potential contaminants, including animals, insects, soils, wind and harvesting and transportation containers. Eating raw dough products has led to outbreaks, primarily caused by Salmonella and E. coli.

"Consuming raw dough or batters made with wheat flour is considered a food safety risk, yet a significant majority of consumers report doing so," Simsek said. There is currently no established kill step for enteric pathogens during wheat milling."

Simsek said traditional pasteurization methods that use high heat to kill pathogens are undesirable in the flour industry because high temperatures can alter the functionality of wheat gluten protein.

"Vacuum steam pasteurization is a promising alternative method for reducing wheat pathogens as this method has been successful with other low moisture foods," Simsek said. "The development of this method for reducing pathogen contamination in wheat could protect public health by preventing foodborne illness."

Simsek joined the NDSU faculty in 2007. She earned her bachelor's degree at Bulent Ecevit University, Turkey; master's degree in biochemistry from Gebze Institute of Technology, Turkey; and doctorate in food science at Purdue University.

Bergholz came to NDSU in 2012. She earned bachelor's degrees in food science and microbiology and her doctorate in food science from Michigan State University.

In June 2019, the NC-213 Administrative Advisor's Office released the Request for Proposals (RFP) for The Andersons Research Grant Program – Regular Competition 2019. Many fine proposals were submitted and reviewed for possible funding. The review committee reviewed, offered comments, and scored all proposals and one was selected to be funded for a two-year period. The proposal selected for funding:



M. Hikmet Boyacioglu to take over as editor-in-chief of Cereal Technology

M. Hikmet Boyacioglu to take over as editor-in-chief of cereal technology

The scientific journal cereal technology is getting a new editor-in-chief: Dr. M. Hikmet Boyacioglu will take over this role on October 1, 2020 from Prof. Dr. Klaus Lösche, who is leaving for personal reasons. The Inger Publishing Group would like to thank Prof. Lösche for his committed cooperation and the many valuable impulses and is glad to be able to win him for future tasks. Prof. Lösche will continue to work for the publishing group and will be a member of the scientific advisory board of cereal technology. Dr. M. Hikmet Boyacioglu is a former industry consultant for companies in the food and cereal industry. He also worked as R&D Executive at Doruk Group Holding, managed the Food Engineering Department at Okan University and was Professor of Food Engineering at the Istanbul Technical University, ITU in Istanbul, Turkey. Currently, Dr. Boyacioglu is working as an Applications Development Specialist at KPM Analytics, Milford, MA, USA, responsible for CHOPIN Technologies instruments in North America and he is an Adjunct Professor in Department of Grain Science and Industry at Kansas State University, Manhattan, KS, USA.

He has been professional member of Cereals & Grains Association (formerly American Association of Cereal Chemists, AACC International); International Association of Operative Millers, IAOM; Institute of Food Technologies, IFT; former National Delegate and Technical Committee Member in "AIBI – International Association of Plant Bakers AISBL"; and former contact person of Turkey at International Association of Cereal Science and Technology, ICC."



Cereal technology is an international and scientific journal, which can be found not only in university libraries, but has also established itself within business practices. Cereal technology is published four times a year and provides direction for all grain processing sectors – from production through to processing technology. The journal is aimed at a readership that is interested both in scientific principles and in technical and technological aspects. As a result, the magazine has readers in more than 40 countries from a wide range of sectors – ranging from cereal producers and mills to large bakeries and the bakery industry. All scientific articles are also provided with a Digital Object Identifier (DOI). These DOIs enable journal articles to be pinpointed more easily and thus made available to the scientific community more quickly.

New Hampshire Agricultural Experiment Station Next Director Named for NH Agricultural Experiment Station

Dr. Anton Bekkerman, associate director of the Montana Agricultural Experiment Station and associate professor of economics at Montana State University, has been named the next director of the New Hampshire Agricultural Experiment Station (NHAES) and associate dean in the College of Life Sciences and Agriculture (COLSA) at the University of New Hampshire.

Dr. Jon Wraith, who has served as the dean of the college and director of the experiment station for nine years, following three years as associate dean of COLSA and associate director of the experiment station, will step down at the end of June and return to the faculty. A national search for the next dean of the college is ongoing.

An agricultural economist, Bekkerman will join UNH and the experiment station in mid-July. "I'm really pleased that we've found such a good person to lead the organization after I step down. I know that our faculty and staff will enjoy working with Anton," Wraith said.

Bekkerman received his PhD in economics from North Carolina State University and his bachelor's in business economics from the Sellinger School of Business at Loyola University in Maryland. His research focuses on a broad range of issues, including crop price dynamics and forecasting, market valuation of food quality characteristics, management of invasive species and pests, farm policy analysis, crop insurance, fertilizer market dynamics, wine pricing, and co-operatives. He also works with interdisciplinary teams of scientists to analyze the agronomic and economic effectiveness of alternative cropping systems, trade-offs of alternative soil management strategies, and cover crops. Finally, his research area has involved broader economic topics, including the economics of education, economics of public libraries, and economic information.



"Being able to join a team that's already very successful and impactful and help grow those successes is a professional dream. The most important part of any agricultural experiment station is the people, and UNH has some of the very best."

-- Dr. Anton Bekkerman

It's great to be joining an already highly successful group of scientists whose research, outreach, and engagement make important contributions to moving forward their professions and the sustainability of the state's and region's food and natural resource system," Bekkerman said.

In particular, he is looking forward to learning more about ongoing research efforts and working with the College of Life Sciences and Agriculture and the New Hampshire Agricultural Experiment Station faculty and professionals to develop strategic efforts for ensuring that the station continues to facilitate meaningful, transformative science—especially in uncertain times. "Being able to join a team that's already very successful and impactful and help grow those successes is a professional dream. The most important part of any agricultural experiment station is the people, and UNH has some of the very best," he said.

Bekkerman is committed to strengthening existing connections between experiment station scientists and stakeholders in the state and region as well as building new ones. He sees his role as station director to be a liaison between scientists and the beneficiaries and supporters of that science.

"New Hampshire has so many diverse communities that are, whether they know it or not, served by the experiment station. How can we better communicate our science to assist those communities? How can I help bring more attention to those communities about the incredible research being done at their state agricultural experiment station and their land-grant university?" Bekkerman wants to help lead the effort to answer these questions.

And after living for over a decade in Montana—where it could take five to seven hours one way to reach a destination—Bekkerman said he's ready to put some miles to highlight the efforts of the New Hampshire Agricultural Experiment Station and to grow the diversity and inclusion of New Hampshire communities that look to the station or science-based solutions and would support future research.

"I see so many great opportunities to contribute. I can't wait to get started!" he said.

When not meeting with stakeholders and scientists, Bekkerman said he'd like to get involved with an area rec ice hockey league (no word yet on if he'll pass muster), become a season-pass holder of the UNH women's and men's hockey teams (whenever those become available), and potentially capitalizing on his more than five years of DJing at KGLU, Montana's community-run radio station, by moonlighting at WUNH 91.3FM.

Founded in 1887, the NH Agricultural Experiment Station (<http://colsa.unh.edu/nhaes>) at the UNH College of Life Sciences and Agriculture (<http://www.colsa.unh.edu/aes>) is UNH's original research center and an elemental component of New Hampshire's land-grant university heritage and mission. We steward federal and state funding, including support from the USDA National Institute of Food and Agriculture (<http://nifa.usda.gov/>), to provide unbiased and objective research concerning diverse aspects of sustainable agriculture and foods, aquaculture, forest management, and related wildlife, natural resources and rural community topics. We maintain the Woodman and Kingman agronomy and horticultural research farms, the Macfarlane Research Greenhouses, the Fairchild Dairy Teaching and Research Center, and the Organic Dairy Research Farm. Additional properties also provide forage, forests, and woodlands in direct support to research, teaching, and outreach.

The University of New Hampshire is a flagship research university that inspires innovation and transforms lives in our state, nation and world. More than 16,000 students from all 50 states and 71 countries engage with an award-winning faculty in top ranked programs in business, engineering, law, liberal arts and the sciences across more than 200 programs of study. UNH's research portfolio includes partnerships with NASA, NOAA, NSF and NIH, receiving more than \$100 million in competitive external funding every year to further explore and define the frontiers of land, sea and space.

Broken Rice Paper by Bruce and Faculty Members in Food Science Named Editor's Pick

A paper written by a doctoral student and other members of the Department of Food Science in U of A's Dale Bumpers College of Agricultural, Food and Life Sciences has been named an "editor's pick" by the Cereals & Grains Association.

The paper, "Physicochemical and Functional Properties of Medium-Sized Broken Rice Kernels and Their Potential in Instant Rice Production," was written by doctoral student Rebecca Bruce, associate professor of food processing and post-harvest system engineering Grif ths Atungulu, and associate professor of biological and agricultural engineering Sammy Sadaka.

The study found the use of broken rice kernels for production of instant rice is feasible and can reduce the cost of raw materials and improve cooked rice sensory characteristics. The authors recommend consumer sensory studies be conducted to determine product acceptability. The research provides information on the enhancement of the value of broken rice as a commodity through novel applications. It also provides science-based information on characteristics of medium-sized broken rice, which is useful in new product development.

The paper was one of two papers selected by Cereal Chemistry Editor-in-Chief Les Copeland for his June editor's picks, saying the research "describes a means to enhance the value of broken rice. The description of the characteristics of medium-sized broken rice will be useful for new product development."

Bruce, who has created her own foundation in Ghana, earned a Doctoral Academy Fellowship from the U of A Graduate School and International Education. She was named Bumpers College's Distinguished Master's Scholar as well as the department's outstanding M.S. student in 2019.

Bruce has won multiple awards at presentations and conferences and is a member of the Institute of Food Technologists and the American Society of Agricultural and Biological Engineers.

Atungulu is Bruce's primary advisor and Sadaka is on her dissertation committee.

Cereal Chemistry is an international journal of scientific papers reporting significant and recent research in areas of genetics, composition, processing and utilization of grains, including barley, maize, millet, oats, rice, rye, sorghum, triticale, wheat, pulses, oilseeds and specialty crops.

About the Dale Bumpers College of Agricultural, Food and Life Sciences: Bumpers College provides life-changing opportunities to position and prepare graduates who will be leaders in the businesses associated with foods, family, the environment, agriculture, sustainability and human quality of life; and who will be first-choice candidates of employers looking for leaders, innovators, policy makers and entrepreneurs. The college is named for Dale Bumpers, former Arkansas governor and longtime U.S. senator who made the state prominent in national and international agriculture. For more information about Bumpers College, visit our website, and follow us on Twitter at @BumpersCollege and Instagram at BumpersCollege.

Atungulu is also a researcher with the Arkansas Agricultural Experiment Station, the research arm of the U of A System Division of Agriculture; and Sadaka is with the U of A System Division of Agriculture Cooperative Extension Service.

Rebecca Bruce was named Bumpers College's Distinguished Master's Scholar in 2018 and has earned a Doctoral Academy Fellowship from the U of A Graduate School and International Education while completing degrees in food science.





GEAPS Cancels Exchange 2020

Published 04/24/2020 by Tom Sedlacek

Weeks after postponing GEAPS Exchange 2020 until July, the Grain Elevator and Processing Society announces today that GEAPS Exchange 2020 is cancelled. All meetings and events scheduled in conjunction with the event are also cancelled. GEAPS will offer refunds in three ways: credit towards any other GEAPS program or service, as gifts to the association or reimbursement. All attendees, sponsors and exhibitors were emailed instructions on how to redeem their credit.

GEAPS International President Steve Myers, Bunge Milling, met with the association's Executive Committee last week to weigh the organization's options ahead of the International Board of Directors' decision this week. In the end, GEAPS decided to cancel the show to protect the health of everyone involved.

"Given the current COVID-19 situation, there was just no way to know if it would be safe to have our conference in July," Myers said. "In the interest of the health of our attendees, exhibitors and staff we have cancelled our conference for 2020. We appreciate the support of our members, sponsors and exhibiting companies through this challenging time."

Executive Director Steve Records said the outcome was disappointing and pointed to how safety is a major theme for many things GEAPS does.

"Given the unknowns we all are facing for the foreseeable future, including the safety of large gatherings of people, we know this is the right thing to do," Records said. "We have immediately turned our efforts to ensuring GEAPS Exchange 2021 in Columbus, Ohio, will be the best conference possible. We are planning and taking precautions to deal with lingering health and safety concerns from COVID-19 next spring."

GEAPS Exchange 2021 is scheduled for Feb. 20-23, 2021, at the Greater Columbus Convention Center in Columbus, Ohio. Booth sales for the conference are currently open and attendee registration will open in the fall.

*The Knowledge Resource for the World of
Grain Handling and Processing Industry Operations*

Pre-harvest Glyphosate Application and Effects on Wheat Protein and Starch Chemistry: Analysis from Application to Harvest - By Senay Simsek and Maneka Malalgoda

A team of scientists from North Dakota State University investigated the pre-harvest glyphosate application on the wheat composition. Glyphosate is the most widely used herbicide in the world and it is sometimes used prior to harvest during wheat cultivation. Glyphosate targets a specific pathway when applied and this pathway is not found in humans, making glyphosate very specific. When glyphosate is applied prior to harvest, it is recommended to be applied a week prior to harvest, when plants are in the ripe stage of maturity. However, due to non-uniform maturation, some plants may not be at this stage when applied. In this study, the goal was to determine how wheat quality as well as starch and protein chemistry are impacted by glyphosate's application time when it is used prior to harvest. A widely used wheat cultivar 'Glenn' was used in this study and glyphosate was applied at the recommended stage (ripe stage) and earlier than recommended (soft dough stage). Wheat heads were collected at different times after application and at harvest and then analyzed for wheat quality characteristics and subjected to chemical analyses. The results of the study showed that early application had more pronounced effects on wheat quality characteristics, for example, kernel weight was significantly lower when applied earlier than recommended. These findings indicated that some chemical properties in wheat starch and proteins may be impacted by glyphosate application. As for starch characteristics, the proportion of small and large starch granules changed as a result of glyphosate application, as well as the percentage of different fractions of digestible starch and wheat flour pasting/cooking properties. Additionally, proportion of different branched starch molecules called amylopectin also changed. As for protein chemistry, the weight of components of gluten forming proteins of wheat was impacted by glyphosate application. A significant increase in the amount of shikimic acid was also seen when glyphosate was applied early. In the first few days after application, the accumulation was quite rapid, and after some time it plateaued off. We also studied the effect of glyphosate on human gut microbiota because the pathway targeted by glyphosate is found in bacteria. We found that glyphosate could impact the population dynamics of the gut microbiome. Overall, the study showed evidence that wheat properties can be impacted by glyphosate application, especially when applied early and showed that further studies are needed to understand how the effect of glyphosate can go beyond the specific pathway that it targets.

Simsek and Malalgoda collaborated with Drs Andrew Green, Joel Ransom and Kirk Howatt from North Dakota State University, and Dr. Jae Bom Ohm from USDA-ARS for this research.

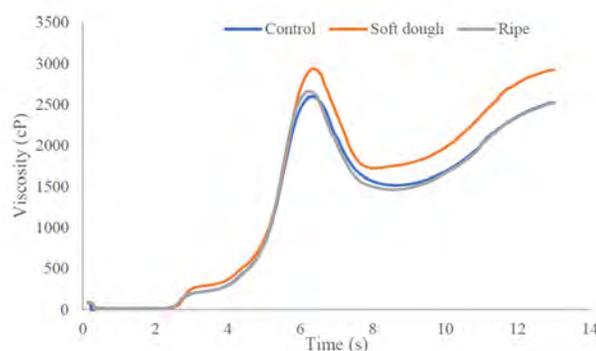


Fig 1. Effect of glyphosate on flour pasting profile

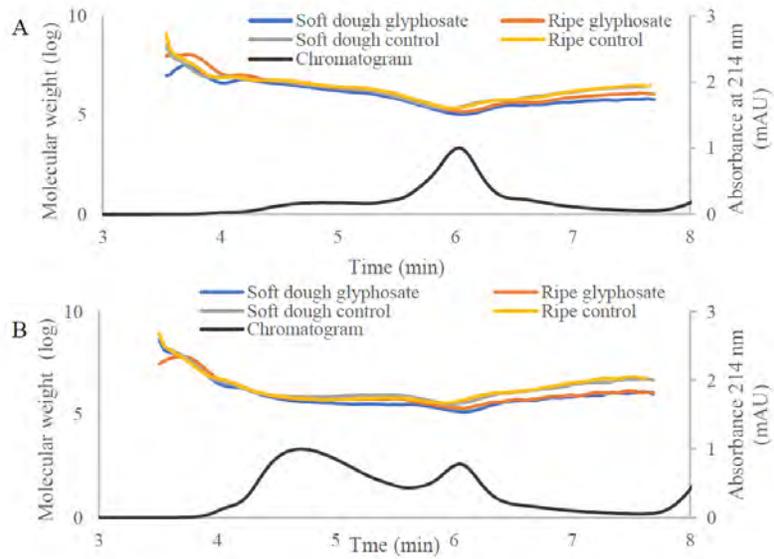


Fig 2. Changes in protein molecular weight distribution as a result of glyphosate application

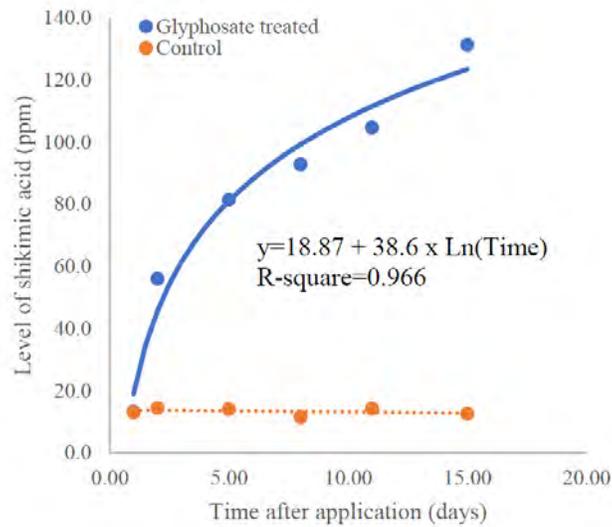


Fig 3. Shikimic acid accumulation when applied at soft dough stage



Fig 4. Starch granule distribution in the wheat kernel

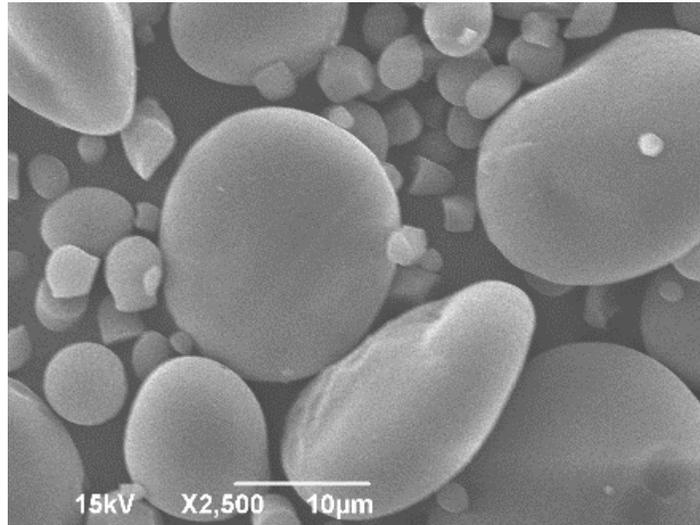
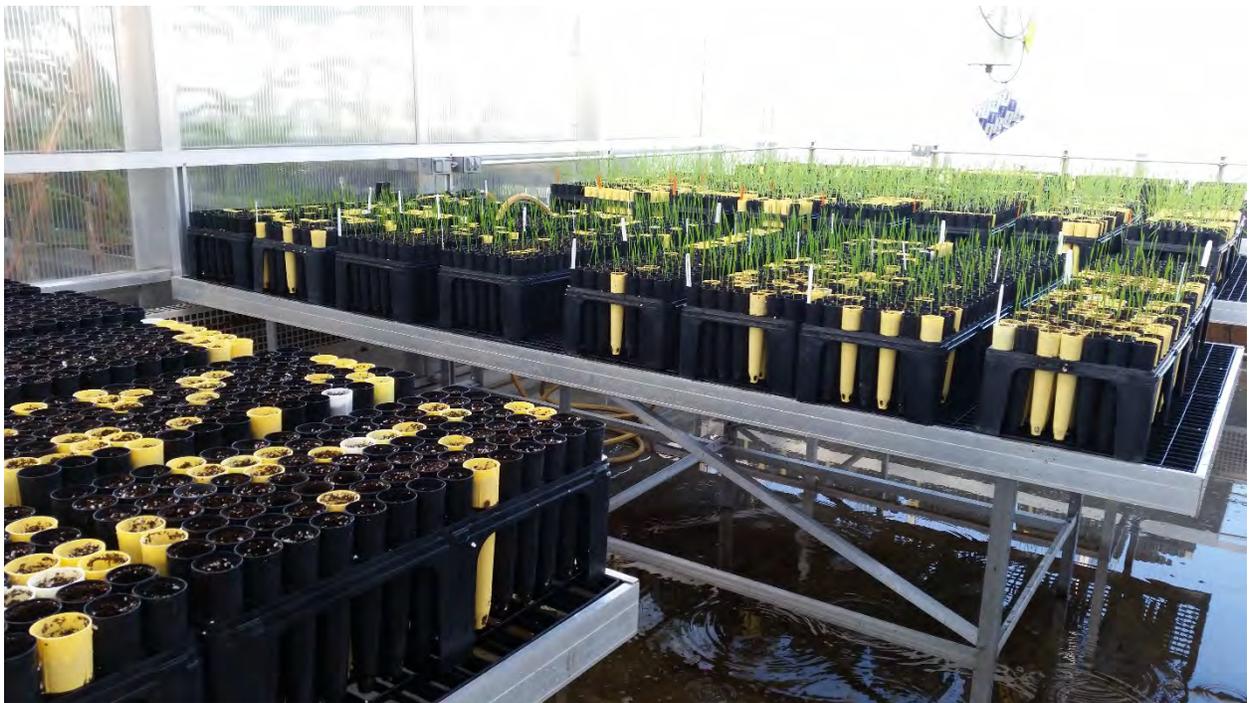
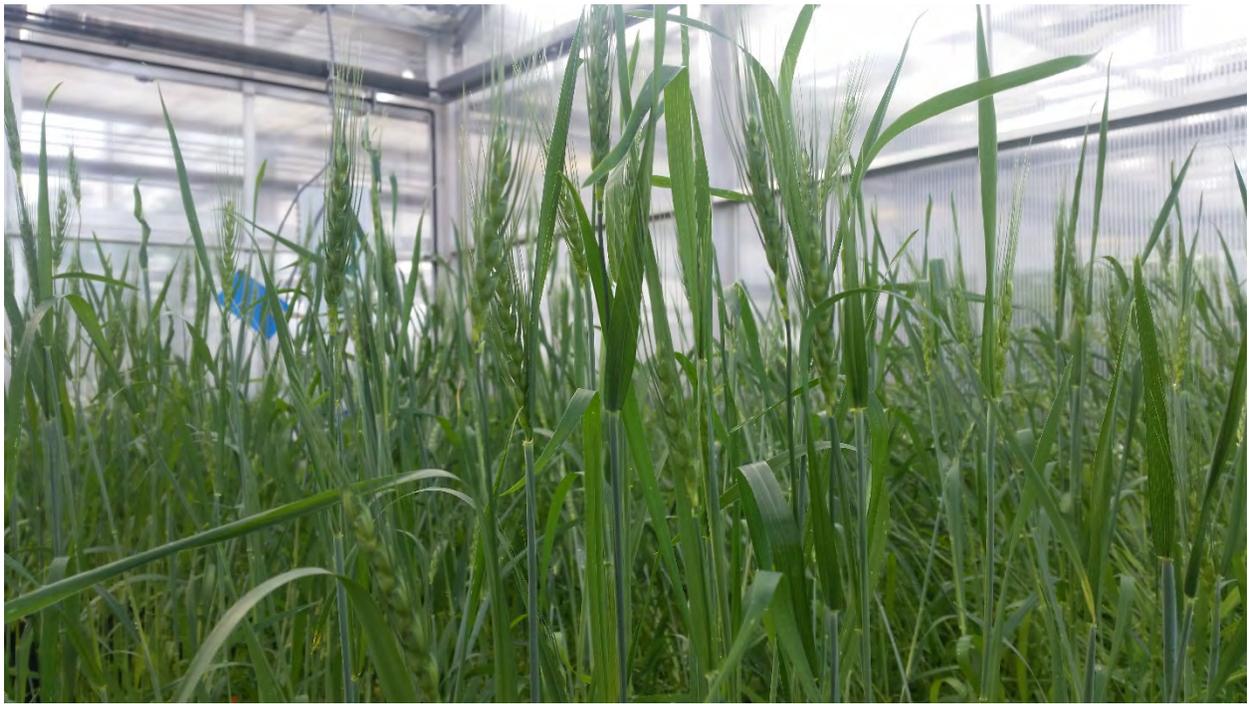


Fig 5. Starch granule morphology analyzed using Scanning Electron Microscopy





Consortium's New Food Loss and Waste Protocol

Jan Broeze and Joost Snels

Wageningen Food & Biobased Research, Wageningen University and Research, The Netherlands - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

Quantifying food loss and waste is essential for identifying hotspots and assessing the effectiveness of interventions and systemic changes. Wageningen Food & Biobased Research, a member of the Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction has developed a new approach allowing for faster implementation of interventions than many traditional approaches.

Additionally, the Consortium is planning to deploy the protocol in up to 10 different nutritious crop (perishable and durable) value chains in Africa and Latin America. The deployment of this protocol and assessment method is unprecedented because it is not a one-off assessment of loss and waste, but rather the Consortium will be collecting information from multiple cases using the same protocol. The Consortium researchers believe a major issue with assessment of loss and waste has been a lack of consistency and this protocol deployment directly addresses that issue. Furthermore, the goal of this protocol is not to collect more and more data, but rather give entities the ability to rapidly and at lower costs, assess food supply chains with the intent of making interventions in those value chains that are healthier, economically sound, and environmentally prudent.

Kyle Poorman, Dirk Maier, and Cassie McGee

Iowa State University – Department of Agricultural and Biosystems Engineering - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

The Consortium now hosts a monthly webinar series. The inaugural webinar was the release of the Consortium's new food loss and waste protocol and the second webinar focused on food system entrepreneurship and the scientific method. [The latest webinar will be held on July 29th, 2020](#) and it will focus on nutrition security and post-harvest loss in Uganda.

Samir Droby and Dr. Amnon Lichter

Volcani Center - Department of Postharvest Science, Israel - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

Dirk Maier

Iowa State University - Department of Agricultural and Biosystems Engineering - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

We are pleased to announce the Consortium's first online course offering. Development of the graduate-level course, "Practical Aspects in Post-Harvest Loss and Waste Management," is led by Professor Samir Droby and Dr. Amnon Lichter (Volcani Center, Israel) with contributions of content and lectures from across the Consortium and other esteemed global experts. The course is slated to be available in August 2020, and a cohort of students from Consortium institutions will participate in the course during the fall semester (USA Collegiate Calendar). This is a continuation and broadening of the Consortium's work on enhancing the academic and entrepreneurial capacity of the next generation. In addition, the Consortium is in the planning phase to add an entrepreneurship course to its online offerings, which is anticipated in 2021.

Tom Brumm and Kyle Poorman

Iowa State University - Department of Agricultural and Biosystems Engineering - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

In Uganda, Iowa State University is implementing a microfinancing model for the deployment of plastic silos that hermetically seal stored grain along with tarps for sun drying and grain handling. The aim is to foster the adoption of post-harvest technologies that will safeguard stored grain by reducing loss from mold, insects and rodents.

Linkages Make Huge Difference

Steve Sonka

University of Maryland – Ed Snider Center for Enterprise and Markets - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

Kyle Poorman

Iowa State University - Department of Agricultural and Biosystems Engineering - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

An initial assessment of the Rockefeller YieldWise intervention in Tanzania by the Consortium indicates that the initiative's multicomponent approach provided important lessons learned, particularly as to the importance of establishing linkages in the maize supply chain. In Tanzania, where maize is a major human staple food, that approach targeted several dimensions of the maize supply chain.

Sonali Shah

University of Illinois – Gies College of Business - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

Kyle Poorman

Iowa State University - Department of Agricultural and Biosystems Engineering - Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction

In December 2019, a Consortium team from the University of Maryland returned to Kenya for a second round of 50 intensive, qualitative interviews. This round was informed by an earlier trip in 2019 that yielded a set of lessons learned that was published on the Consortium website. Dr. Sonali Shah and Audra Wormald led a team that interacted with a cohort of people that worked throughout the mango value chain. The interviews yielded a range of initial impressions about farmers ability, willingness, and motivation behind adopting YieldWise interventions.