Grain Quality Newsletter

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

Volume 39:2 NC-213: The U.S. Quality Grains Research Consortium

NC-213 Annual Meeting/Technical Sessions/Poster Showing 2020 – Please Mark Your Calendar!

The NC-213 Annual Meeting/Technical Sessions/Poster Showing with Student Poster Competition will be held March 24-25, 2020 in Minneapolis, Minnesota, at the Hilton Minneapolis, 1001 Marquette Avenue South, Minneapolis, Minnesota USA 55403 (612) 376-1000. Here is the "Program at a glance:"

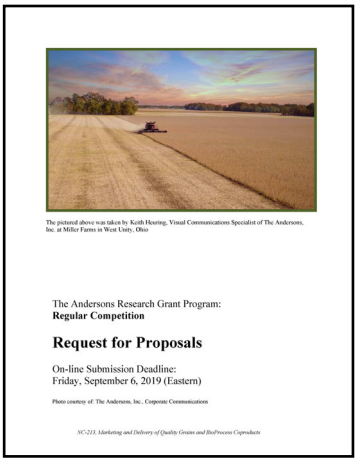
Tuesday, March 24, 2020:

12:00PM (Noon) - NC-213 Meeting Registration Opens. Poster Display is available. Boxed lunches are available. (See registration form for details.)
1:00PM - NC-213 Technical Sessions begin. Location: (Room-To be determined.)
4:00PM – 6:00PM - NC-213 Poster Showing/Student Poster Competition/GEAPS Networking Gathering. (Tentative time based on GEAPS President's Banquet.) Location: (Minneapolis Convention Center Ballroom area.)
6:00PM - Tentative time for GEAPS President's Banquet to include The Andersons Awards.

Wednesday, March 25, 2020:

7:00AM - Buffet Breakfast for all registered and paid participants. Location: (Room-To be determined.)
8:00AM - NC-213 Technical Sessions begin.
12:30PM - Buffet Lunch - To include NC-213 Annual Business Meeting, People's Choice Award. Meeting Adjourned.

Please look for updates on the NC-213 Annual Meeting. Questions? Please contact Bill Koshar, NC-213 Administrative Support



The Andersons Research Grant Program – Regular Competition 2019
Request for Proposals Released!

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. The goal of The Andersons Research Grant Program is to develop new approaches and technologies to maintain or improve the quality of cereals and oilseeds from harvest to end use, while preserving the environment, and maintaining consumer safety. These approaches and technologies must be developed and implemented if the U.S. is to remain at the forefront of the world's major producers. This program is focused on facilitating multidisciplinary, multistate, and multiagency collaborative research to address critical cereals and oilseed research issues.

NC-213 In Search of an Objective Co-Chair – Join the Executive Committee!

NC-213 is looking to fill a vacancy for the position of Objective 2 Co-Chair; "To improve management and operational systems to increase efficiency, retain quality, enhance value, and preserve food safety in the farm-to-user supply chain." Each Objective has two Co-Chairs, so the newly appointed Co-Chair will have a "mentor" to help in learning the ropes!

Below is a list of Responsibilities for each Objective Co-Chair:

--Each Objective is chaired by two Co-Chairs. Each co-chair is elected for a two-year term. Co-Chairs can be reelected for consecutive terms.
--Organize and moderate oral reporting sessions for their objectives at the Annual meeting.
--Facilitate revisions to their objectives in NC-213 five-year work plan.
--Serve on Executive Committee.
--Coordinate communications between administrators and members of that Objective team.
--Participate in Executive Committee meetings, contributing to decisions involving organizational, policy, and meeting topics (Annual meeting).
--Forward newsworthy items identified by researchers at their respective stations to the Administrative Advisor/Coordinator.
--Each Objective Co-Chair will provide at least one item per year for the newsletter, either their own work or a report from someone else within the Objective.
--Serve on the Andersons Grant Review Committee unless a conflict of interest exists.

This is an excellent opportunity for a Member of NC-213 (Must be on the Appendix E) to gain more involvement in the project and to learn and grow, possibly leading to the position of Chair.

Questions? Please contact Bill Koshar, NC-213 Administrative Support

"Finding the Sweet Spot" While Demand for Hard Wheat Products has Declined, the News for Soft Wheat Products is More Promising. This is a reprint, with permission, that appeared in and is attributed to World Grain.

by M. Hikmet Boyacioglu

While global demand for hard wheat-based products such as bread has declined in recent years as consumers have shifted toward protein-rich, low-carbohydrate diets, there's more promising news regarding products made from soft wheat flour.

"There are some considerable sweet spots within the soft wheat market," said Pinar Hosafci, industry manager, packaged food, Euromonitor International.

Cakes, cookies, crackers and Asian-style noodles are among the soft wheat flour-based products that are gaining in popularity.

Flours produced from soft textured kernels possess lower levels of starch damage, have lower water absorption, and smaller particle size distributions than hard wheat flours. Hence, their preferential use in different products. Hard wheats primarily are utilized in bread production, whereas soft wheats are used to make cakes, cookies, crackers, pastries, donuts, biscuits, waffles, muffins, pancakes, pie crusts, flat breads and some Asian-style noodles. One commonality of soft wheat products is that most of them are chemically leavened, unlike hard wheat products, which are usually yeast leavened.

Hosafci notes that cookies and cakes offer the best prospects.

"Euromonitor predicts that the global cookies market will reach $76 billion in 2019, up from $60 billion in 2014, growing at an impressive 5% CAGR over the next five years," he said. "The majority of this growth comes from emerging markets of the Middle East and Africa and Latin America, where cookies are the most affordable and popular snack of choice, prompting both local and multinational companies to innovate into novel occasions like breakfast and target groups like children and elderly.

"Cakes is another lucrative category surpassing $15 billion in 2019, with Asia Pacific taking the lead. The unprecedented innovation and dynamism of the artisanal market, in particular bakeries, underlie cakes' growth. Noodles and pasta markets are also flourishing, with noodles making inroads into the Western markets due to the rise of the Asian cuisine and pasta gaining more popularity in Asia and the Middle East brought by the rise of the Italian-style restaurants."

SOFT WHEAT BREEDING

While hard wheat has for centuries been grown in numerous countries on all five continents, soft wheat is less geographically diverse.

"Soft wheat (SRW and SW) is pretty much produced in the United States," said Steve Mercer, vice-president of communications for U.S. Wheat Associates. "Canada has a limited amount of SRW on the east coast and some SW on the west coast, but the production is small and exports total 200,000 tonnes in a good year. Other countries really don't produce soft wheat with special classes like the U.S. and Canada. Australia has a group of low protein wheat that can be used to make many soft wheat products, but the genetics are different and ASW is not really a soft wheat."

The U.S. Department of Agriculture (USDA) estimated SW wheat production of about 6.5 million tonnes and SRW production of 8 million tonnes in 2018. According to U.S. Wheat Associates, Ontario, Canada, produced 2.1 million tonnes of SRW wheat in 2018.

Both public and private breeding institutions continuously test experimental lines using traditional and novel breeding methods to develop new varieties considering yield, disease resistance and, more importantly, for improved end-use quality.

Generally, soft wheat varieties have been bred to yield flour containing less protein than hard wheats, about 8% to 11% versus 10% to 14% protein, respectively. Furthermore, hard wheat varieties have been selected for high water absorption and, hence, for thicker endosperm cell walls.

"Surprisingly, when bread wheat first formed 10,000 years ago, it was soft," said Craig F. Morris, director, USDA Western Wheat Quality Lab.

All hard kernel wheats have since arisen via mutations in the *Puroindoline* genes. Globally, soft wheats have largely taken a back seat to hard wheats due, in part, to directed breeding efforts, combining hard kernel and strong gluten. Hard wheats do have an advantage in producing flours with higher starch damage, which is good for dough fermentation and water absorption.

"However, for many low moisture products such as cookies (biscuits) and crackers, starch damage and high-water absorption are undesirable," Morris said. "Soft wheats too can have strong gluten. The glutenin and gliadin genes are independent from the *Puroindolines*. Probably the biggest technical challenge related to soft wheat milling is that their flours, comprised of smaller mean particle size, do not flow well and re- quire greater sifting/bolting surface."

SOFT WHEAT MILLING

Soft wheat breaks down more quickly than hard common wheat. More flour is produced on the break system for soft wheat than for hard wheat, requiring greater sifting capacity for the former. Endosperm of soft wheat adheres more strongly to bran, reducing flour extraction rate expectations by up to 2% unless sifting capacity is increased. Yield of semolina and middlings is lower, so purifiers are of less importance and often are absent. Stock is stickier and fluffier, which makes it more difficult to sift than hard wheat stock. Soft wheat is fed more slowly to the mill to facilitate sifting and to ensure that stock flows freely through the mill. Generally, this results in lowering of production by about 25% to 30% when milling soft wheat in a hard wheat mill.

"Soft wheat requires less tempering moisture (13% to 14.5%) and less time (4 to 8 hours) to rest in the tempering process when compared to hard wheat," said Jeff Gwirtz, a milling industry consultant and president of JAG Services Inc. "Excessive temper moisture in soft wheat reduces the miller's ability to sift efficiently and remove endosperm from the bran as well as negatively impacting flow properties and mill balance. Soft wheat more easily releases its endosperm as flour rather than granular endosperm particles requiring purification to classify compound particles. The flour generated from soft wheat has a very fine particle size (D_{50}=30 ± µm) when compared to hard wheat flour (D_{50}=62 ± µm). This contributes to increased sifting and separation challenges in the mill often requiring more sifter and roll surface and changes in allocation due to loading (see Figure 1).

"In the production of straight grade flour, the ash content and yield differences between soft and hard wheat flour are minimal. Generally, soft wheat will produce a slightly lower flour yield with a somewhat lower ash content. Soft wheat does produce significant quantities of low ash bright white flour suitable to a variety of specialized products, including cakes, cookies, pastries, pretzels and crackers. Soft wheat millers must balance the technical requirements as well as manufacturing economics to maximize resource utilization while maintaining profitability."

POPULAR SOFT WHEAT PRODUCTS

Cake can be defined as a sweet, usually finely texturized food product, baked in various forms that differ in size and configuration. İt generally contains such ingredients as soft wheat flour, milk or other liquids, sugar, eggs, chemical leaveners, flavor extracts and spices as well as others that may or may not include shortening. Cake varieties cover a wide range from pound cake to yellow and white layer cakes, cakes containing chocolate and cocoa products, sponge cakes, angel food cake, fruit cakes and foam-type cakes, donuts and many others.

Cakes, muffins, quick breads, cake donuts, pancakes and waffles are all made from batters. Batters contain more water than doughs do, but the distinction between a dough and a batter is not always clear.

Although relatively less flour is used in cake making than in bread or cookie making, it profoundly affects quality. Cake volume is negatively correlated with wheat hardness and soft wheat flour is indeed preferred for high-quality cakes, mainly because of its small particle size.

Cookie is a small cakelike product, either flat or slightly raised, usually – but not always – with a relatively low moisture content, made from a dough or batter that is sufficiently viscous to permit the dough pieces to be baked on a flat surface. Cookies come in an infinite variety of shapes, sizes, composition, texture, tenderness, colors and tastes. The term is synonymous with biscuit as used in most countries other than the United States and Canada.

Figure 1: Soft and hard wheat millstock load and flour production comparison

	Hard wheat		Soft wheat	
Breaks: Primary: B1/B2, B3 Secondary: B4, B5 Aux. Sys DB1/B2, DD1, DB3, DB4, Df, Br vibro	100%	5%-10%	100%	40%-60%
Sizings: (D1, R1C)	45%-65%	5%-10%	NA, 15%-25%	NA, 6%-18%
Purification: (P1-P7)	25%-50%	NA	NA	NA
Reduction: R1M, R1F, R2A, R2B Primary: C1, C1B, C2, C3, C4 Secondary: C5, C6, C7	45%-65%	45%-65%	35%-55% w/out sizings 15%-55% with sizings	35%-55% w/out sizings 25%-35% with sizings
Residue: (R3, R4)	10%-20%	2%-5%	10%-20%	2%-5%
Low Grade: (C8)	1%-5%	1%-3%	1-3%	1%-3%

Soft wheat flour is preferred to produce cookies because it binds less water than hard wheat flour. Water relationships in cookie dough have a major effect on cookie quality (i.e., cookie spread, texture). If hard wheat flour is used in a cookie formula, the result is usually a tough or very hard cookie that spreads little during baking.

Cracker is a dry, usually thin, crisp biscuit that may be either semi-sweet and chemically leavened, as graham crackers and the highly-flavored snack crackers or unsweetened, fermented and layered, as the soda cracker.

There are several types of crackers, but all are made from doughs. Water relationships are very important in cracker processing, and soft wheat flour with a low and constant absorption is preferred.

Noodles are widely consumed in East and Southeast Asia and are a staple in Northern China. The popularity of noodles, particularly instant noodles, has spread globally.

There are two general types of wheat flour noodles: Chinese white salted noodles and yellow alkaline noodles, known as Udon and ramen noodles, respectively, in Japan. Noodles are generally made from flour from common wheat, rather than from semolina of farina, and contain salt(s), in addition to flour and water. However, starch noodles, made principally from mung bean starch, also are produced throughout Asian countries but are consumed less frequently than flour noodles.

Chinese-type noodles are generally made from hard wheat flours, characterized by bright creamy white or bright yellow color and firm texture while Japanese white salted noodles are typically made from soft wheat flour of medium protein content. It is desirable to have a creamy white color and a soft and elastic texture in Japanese noodles. The finer particle size and lower protein of soft wheat flour gives the soft and elastic bite and smooth surface desired for Japanese white slated noodles. As flour protein content increases, noodle firmness increases, therefore, the optional flour protein for Japanese white salted noodles is lower than for yellow alkaline noodles. As protein content increases, flour becomes darker and, accordingly, noodles brightness is reduced.

Noodles can be made from either red wheat or white wheat. However, white wheat has an advantage over red wheat for making noodles because the bran specks from white wheat are less conspicuous.

Dr. M. Hikmet Boyacioglu is an industry consultant and former Group R&D Coordinator of Doruk Group Holding and professor of the food engineering department at Istanbul Technical University in Istanbul, Turkey.
He may be reached at mhboyaci@gmail.com.

Iowa State University Part of Innovative Consortium to Reduce Post-Harvest Loss and Food Waste

April 17th, 2019

AMES, Iowa — Food loss and waste is a global problem that negatively impacts the bottom line of businesses and farmers, wastes limited resources and damages the environment. The Foundation for Food and Agriculture Research (FFAR), The Rockefeller Foundation and Iowa State University today launched the Consortium for Innovation in Post-Harvest Loss and Food Waste Reduction at the 2019 Iowa International Outreach Symposium .

Through this consortium, food loss and waste thought leaders and experts from across the globe will work in tandem with industry and nonprofit organizations to address social, economic and environmental impacts from food loss and waste.

"Feeding a growing global population demands innovation at all levels — from planting to processing to consumption. This consortium will help farmers across the globe use technology to continue using resources efficiently," said Sally Rockey, FFAR's executive director. "Optimizing food production practices is critical for ensuring that farmers are profitable, food is plentiful and accessible, and the environment is preserved."

Due to the volume of food that is moved globally, food loss and waste affects producers, manufacturers, distributors and end-users. More than 40% of fruits and vegetables in developing regions spoil before they can be consumed. These goods include mangoes, avocadoes, pineapples, cocoa and bananas, many of which are exported to the United States.

This loss negatively impacts the bottom line for farmers, who are not compensated for their products. Consumers then don't have access to these popular foods. Additionally, food waste forces farmers to use precious natural resources producing food that either never makes it to the supermarket or is otherwise thrown out by consumers due to quality issues, creating a significant drain on environmental resources.

"Our consortium approach will build academic and entrepreneurial capacity of the next generation by engaging researchers and students in multi-national, multi-disciplinary teams in the project identification, planning, and execution phases together with professionals from the private and public sectors," said Dirk Maier, the consortium director and a professor in the Department of Agricultural and Biosystems Engineering at Iowa State, where the consortium will be located.

To read more on this story, please visit this URL – website. Thank you.

https://www.cals.iastate.edu/news/releases/iowa-state-university-part-innovative-consortium-reduce-post-harvest-loss-and-food

Mycotoxins in grain: can we predict and avoid their development?

Dr. Efstathios Kaloudis
Phycist with Ph.D. on Computational Fluid Dynamics.
Centaur Analytics, Inc.

MYCOTOXIN CONTAMINATION IN THE FOOD SUPPLY CHAIN

Mycotoxins are poisonous compounds produced by certain species of fungi growing on grain and feed products when stored in unsafe moisture content conditions. Mycotoxins cause, at very low dosages (parts per million (ppm) or parts per billion (ppb)), a variety of human and animal health problems. The ingestion of mycotoxins can produce both short-term and chronic toxicities ranging from death to chronic interferences of the central nervous, cardiovascular, pulmonary systems, and of the alimentary tract [1].

The mycotoxins have attracted worldwide attention, over the past 30 years, firstly because of their perceived impact on human health, secondly because of the economic losses accruing from condemned foods/feeds and decreased animal productivity and, thirdly, because of the serious impact of mycotoxin contamination on internationally traded commodities. It is estimated, for example, that the cost of managing the mycotoxin problem on the North American continent is approximately $5 billion [2].

MOLD DEVELOPMENT AND MYCOTOXIN PRODUCTION ON POST-HARVEST GRAIN STORAGE

The major factors that determine whether grain in storage would be invaded sufficiently by fungi are:
-grain moisture content
-grain temperature
-storage time period
-amount of broken grains and foreign materials present
-the degree to which the grain already has been invaded by fungi before it arrives at a given site
-presence of insects and mites

All these factors interact with one another to some extent, but the major determinants are moisture content, relative humidity, temperature and time [3]. Among the fungal species that may contaminate grain, some of them will be able to produce mycotoxins. Some of the molds and their associated mycotoxins that are currently considered to be of worldwide importance are shown in Table 1.

Table 1: Molds and mycotoxins of world-wide importance [4]

Mold species	Mycotoxins produced	Commodities often affected
Aspergillus	Aflatoxins	corn, rice, peanuts
Aspergillus, Penicillium	Ochratoxin	wheat, corn, rice
Fusarium	Deoxynivalenol (DON)	corn, wheat, rice, hay
Fusarium	Zearalenone	corn
Fusarium	Fumonisin	corn

THE CHALLENGE

The scientific literature [5] suggests that a management strategy of prevention of mold spoilage and mycotoxin contamination of stored grain should consists of the following steps:
-Identification of critical storage situations enabling mold growth
-Monitoring early signs of fungal activity
-Preventive measures and anticipation of mycotoxigenic mold growth
-Practical solutions for the reduction of existing contamination (by mold and/or mycotoxins)

PREDICTING MOLD DEVELOPMENT

In view of the above, in-depth knowledge and understanding of silo microclimate is crucial. An efficient method for tackling this is through the combination of field measurements and computer simulation based on Computational Fluid Dynamics (CFD) models. CFD is a branch of fluid mechanics that uses numerical analysis and data structures to solve and analyze problems that involve fluid flows and heat transfer. Fast computers (typically on the cloud) are used to perform the calculations required to simulate the interaction of liquids and gases with surfaces defined by boundary conditions. To evaluate accurately the storage structure interaction with its surroundings, the computational model should integrate weather forecast for the specific location and time period.

Additionally, the algorithm process temperature and relative humidity data coming from sensors, like the ones developed by Centaur Analytics, Inc. (Figure 1). The devices are equipped with wireless connectivity with the ability to transmit data frequently (e.g. every 2 hours) from inside stored grain. The data were transmitted in real time to a cloud platform enabling instant and automated grain condition predictions.

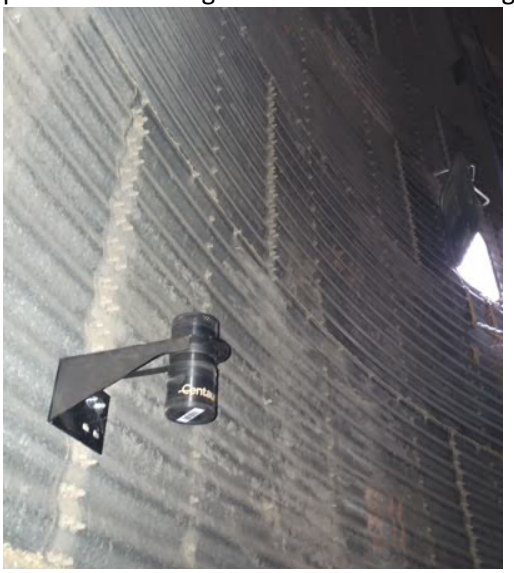


Figure 1: Example of wireless sensor installation inside a silo feeding the predictive algorithm with real-time data

APPLICATION EXAMPLE

To illustrate the capabilities of the approach and the way it addresses all the challenges described above, a typical grain storage scenario is presented. The silo under consideration was located at Topeka, Kansas (USA) and the storage period started in the summer (Figure 2). The steel silo diameter was D=8 m / 26ft and its height was H=16 m / 52 ft. The initial temperature and moisture content of wheat were 25 oC / 77 oF and 13.6 % respectively.

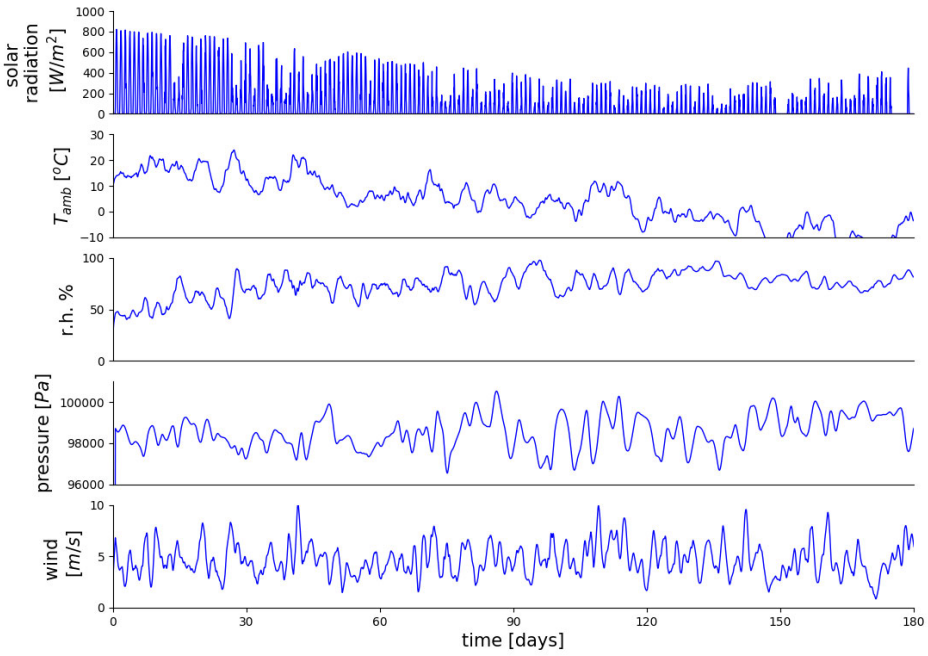


Figure 2: Time variation of weather conditions at the silo site: solar radiation, temperature, relative humidity, atmospheric pressure and wind velocity

The model predicts the temperature and moisture content profiles for the entire storage structure. As already mentioned above this information is correlated with mold development models that calculate the areas inside the silo with a higher risk of mold development, potentially leading to toxin contamination of the grain. Figure 3 presents these profiles after 3 and 6 months of storage time A video of the forecast for the entire storage period can be viewed in the following link: https://youtu.be/NMJMip0-VW4 . It is evident that temperature and moisture content profiles are non-uniform inside the structure. Higher temperature values are present at the core of the silo since the grain outer layers are cooled by the ambient temperature. Moisture accumulation is predicted near the grain surface after 3 months leading to an area with a high risk of mold development at the end of 6 months.

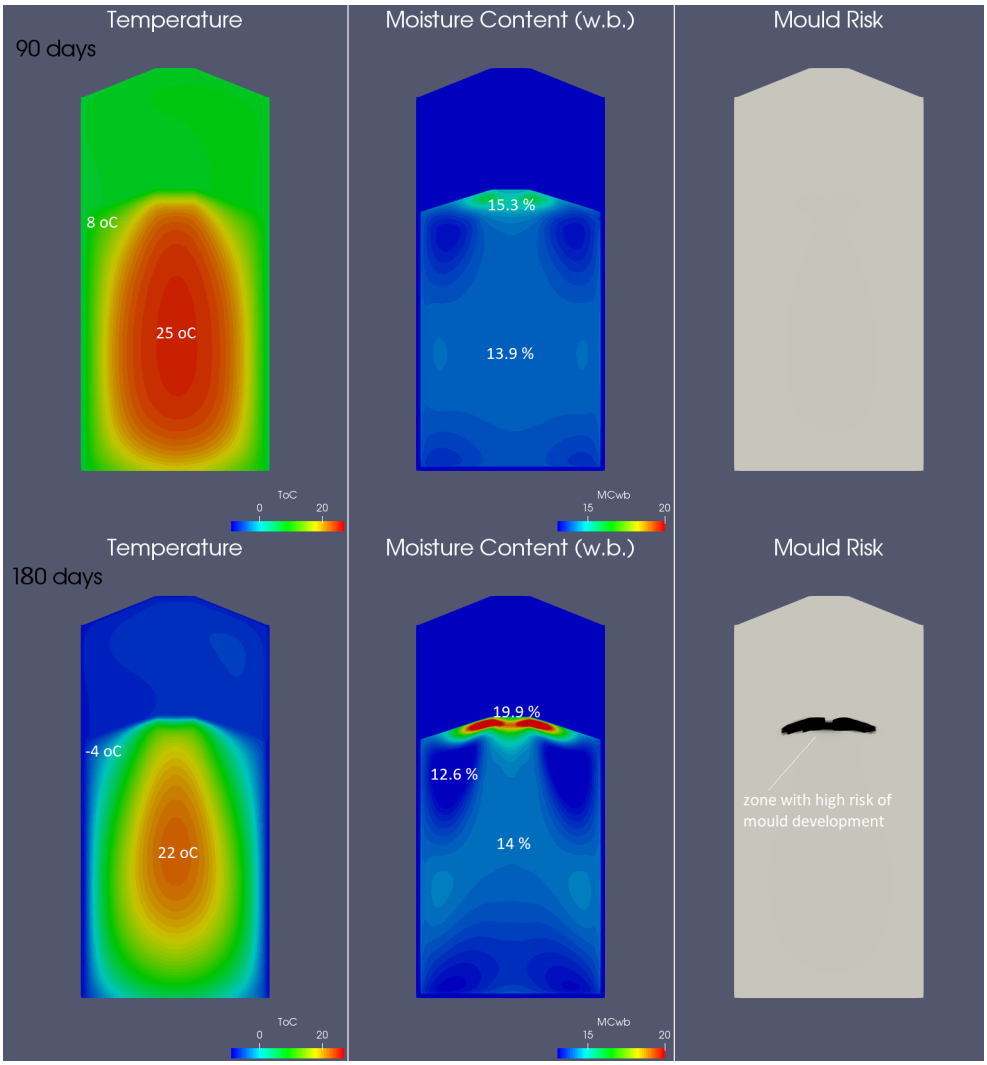


Figure 3: Grain temperature, moisture content and mold risk profiles after 3 months (top) and 6 months (bottom) of storage. A video of the simulation is also available in the following link: https://youtu.be/NMJMip0-VW4

THE BENEFITS

Wireless sensor technology combined with advanced data analysis techniques provide predictions of the grain temperature, moisture content, and risk of mold development throughout the storage period, bringing unprecedented benefits to the users:
prevention of mold development and mycotoxin contamination
cost-effective prevention strategies for mold development
higher commodity market value
supply chain transparency

REFERENCES

[1] World Health Organization (WHO), https://www.who.int/news-room/fact-sheets/detail/mycotoxins
[2] Food and Agriculture Organization (FAO), Grain storage Techniques – Evolution and trends in developing countries. Agricultural Services Bulleting No. 109
[3] FAO, Mycotoxin prevention and control in foodgrains
[4] Hurburgh Jr, C. R. Mycotoxins in the Grain Market, Iowa State University – Extension and Outreach.
[5] Lessard, F. (2015). Integrated approach of the prevention of mould spoilage risks and mycotoxin contamination of stored grain – a European perspective. 10th IOBC-WPRS International Conference 2015 on Integrated Protection of Stored Products, At Zagreb, Croatia.

Calendar of Events

JULY 2019

July 21-26:

"1st International Wheat Congress". TCU Place. Saskatoon, Saskatchewan, Canada.

Contact: IWC 2019 Secretariat. c/o Venue West Conference Services. 301 – 1040 Hamilton Street, Vancouver, BC V6B 2R9 Canada. Tel: +1 (604) 681-5226, Fax: +1 (604) 681-2503, Email: secretariat@2019iwc.ca, Web: http://2019iwc.ca/

July 25-26:

"International Association of Operative Millers, IAOM Central, Wheat State & Texoma Districts Conference". Chateau on the Lake. Branson, MO, USA.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

AUGUST 2019

August 7-9:

"International Association of Operative Millers, IAOM Flour City District Conference". Madden's on Gull Lake. Brainerd, MN, USA.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

August 14-16:

"International Association of Operative Millers, IAOM Western District Conference". Doubletree Portland. Portland, OR, USA.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

August 20-22:

"2019 U.S. SOY Global Trade Exchange and Specialty Grains Conference". Hilton Chicago. Chicago, IL, USA.

Contact: Eric Wenberg, Executive Director, Specialty Soya & Grains Alliance. Email: ewenberg@soyagrainsalliance.org, Eric Gibson, Industry Relations Manager, U.S. Soybean Export Council. Email: egibson@ussec.org, Web: www.grainconference.org

August 27-29:

"69th Australasian Grain Science Conference, AGSA 2019: 'Grains: A Global Food Resource'". Rydges on Swanston. Carlton, Melbourne, VIC, Australia.

Contact: Dr. Joe Panozzo, Conference Chair. Australasian Grain Science Association Inc. Email: conference@ausgrainscience.org.au, secretary@ausgrainscience.org.au, Web: www.ausgrainscience.org.au, www.ausgrainscience.org.au/conference/2019-conference/

SEPTEMBER 2019

September 6-15:
"Annual Kansas State Fair". Kansas State Fairgrounds. Hutchinson, KS, USA.
Contact: Tel: +1 (620) 669 3600, Fax: +1 (620) 669 3640, Web: www.kansasstatefair.com

September 8-11:

"International Baking Industry Exposition, IBIE 2019". Las Vegas Convention Center. Las Vegas, NV, USA.

Contact: Web: www.ibie2019.org

September 10-12:

"The Big Iron Farm Show and International Visitors Program". West Fargo, ND, USA.

Contact: North Dakota Trade Office. 811 2nd Avenue North, Suite 284, Department 0510, P.O. Box 6050 Fargo, ND 58108, USA. Tel: +1 (701) 231 1150, Fax: +1 (701) 231 1151, Email: info@ndto.com, Web: www.bigironfarmshow.com

September 11-12:

"Global Grain South America". Sao Paolo, Brazil.

Contact: Euromoney Institutional Investor PLC. Tel: + 44 (0) 20 7779 7222, Email: info@ggrain.com, registration@ggrain.com, Web: www.globalgrainevents.com

September 11-13:

"International Association of Operative Millers, IAOM Western Canadian District Conference". Moosejaw. Saskatchewan, Canada.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

September 16-17:

"International Association of Operative Millers, IAOM MEA 2019 Regional Forum". Crowne Plaza. Beirut, Lebanon.

Contact: IAOM MEA Region, PO Box 106, Al Khuwair, PC 136, Sultanate of Oman. Tel: +968 2439 8767, Fax: +968 2439 8748, Email: info@iaom-mea.com, Web: www.iaom-mea.com, http://www.iaom-mea.com/iaom-mea-2019-regional-forum/

September 21-24:

“Südback, Trade Fair for Bakery and Confectionery Trades”. Messe Stuttgart. Stuttgart, Germany.

Contact: Landesmesse Stuttgart GmbH. Tel: +49 711 18560-0, Email: info@messe-stuttgart.de, Web: www.messe-stuttgart.de/en/suedback/

September 25-26:

"18th World Congress on Nutrition and Food Chemistry". Copenhagen, Denmark.

Contact: Daniel Craig, Program Director, Nutri-Food Chemistry 2019. Email: nutri.foodchemistry@conferencesguide.org, Web: www.annualcongress.com/meet-us/nutrition-food-chemistry-2019-113

September 25-27:

“Women in Agribusiness Summit”. Hyatt Regency Minneapolis. Minneapolis, MN, USA.
Contact: Joy O'Shaughnessy, HighQuest Group. 300 Rosewood Drive, Suite 260, Danvers, MA 01923, USA. Tel: +1 (978) 887 8800, Email: joshaughnessy@womeninag.com, Web: www.womeninag.com
25 - 27 September:

“International Association of Operative Millers, IAOM Wolverine, Southeastern, Niagara, Ohio Valley Districts Conference”. Kalahari Resorts. Sandusky, OH, USA.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

OCTOBER 2019

October 6-8:

“International Association of Operative Millers, IAOM Annual Southeast Asia Region Conference & Expo”. Jakarta, Indonesia.

Contact: International Association of Operative Millers, IAOM. 12351 W. 96th Terrace, Suite 100 Lenexa, Kansas 66215, USA. Tel: +1 (913) 338 3377, Fax: +1 (913) 338 3553, Email: info@iaom.info, Web: www.iaom.info

October 7-8:

“Tortilla Industry Association, T.I.A. Tech 2019”. Las Vegas Convention Center. Las Vegas, NV, USA. (Co-Located with IBIE Convention)

Contact: Tortilla Industry Association. 1400 North 14th Street, Arlington, VA 22209, USA. Tel: +1 (301) 367 8200, Fax: +1 (800) 944 6177, Email: info@Tortilla-Info.com, Web: www.tortilla-info.com

October 9-11:

“Grain & Milling Expo”. La Foire Internationale de Casablanca. Casablanca. Morocco.

Contact: Mrs. Soumaya Esseddiki, Communication Responsible. National Federation of Moroccan Millers. Angle Bd Abou Majid Al Bahar et Rue El Brihmi El Idrissi. Casablanca, Morocco Tel