AEIC 2023 Spring Meeting Minutes

P.L. Hunst, AEIC Secretary

Hosted by Indiana Crop Improvement Association, March 29-30, 2023

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AEIC Spring 2023 Meeting Minutes

March 29-30, 2023

Lafayette, Indiana

P.L. Hunst (BASF), Secretary

The AEIC Spring 2023 Meeting was held on March 29-30 with approximately two-thirds of the attendees in-person and the other third joined virtually. Kristen Kouba, AEIC Past-President, welcomed everyone to the meeting and presided over the round table in-person introductions following the antitrust reminder.

John Zheng, Indiana Crop Improvement Association (ICIA), welcomed the group to Lafayette and gave an overview of ICIA. ICIA was founded in 1900 at Purdue University and was originally called the Indiana Corn Growers Association. The name was changed in 1956 to ICIA. ICIA moved to its current location in 1999 which consists of 40 acres and 30,000 sq ft of lab space. ICIA has 3 main program areas: field programs, seed lab testing, and genetic lab testing. Under the field programs are seed certification, IP programs and QA programs. ICIA is a member of AOSCA (Association of Official Seed Certifying Agencies) which has 45 state member agencies in the U.S. Under ICIA's seed testing, tests are conducted for germination, vigor, and physical purity. ICIA is a lab for the Non-GMO Project. ICIA also conducts PCR and ELISA testing as well as doing customized testing for customers. ICIA is one of the largest crop improvement associations in U.S.

AEIC BUSINESS MEETING

Approval of 2022 Fall Meeting Minutes: A motion was made and seconded to approve the minutes posted on the website. Motion was approved by member vote.

Treasurer Report (L. Muschinske): The Treasurer presented the 2023 proposed budget as follows:

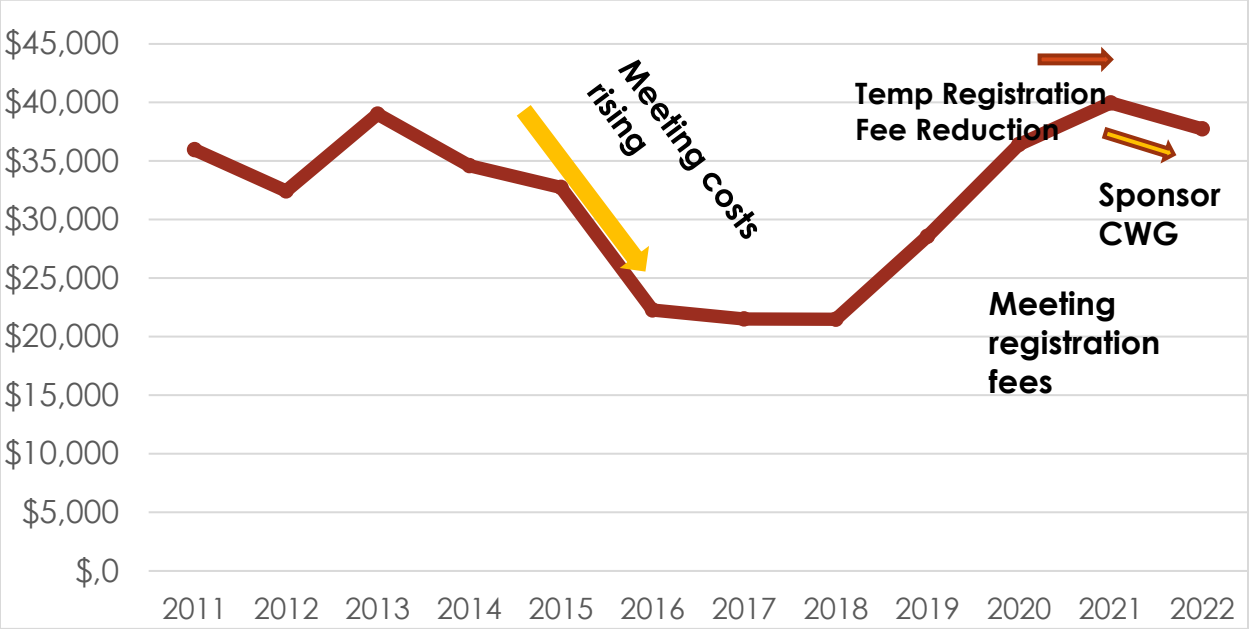
AEIC 2023 Budget Summary

	Planned	Actual	
Beginning Balance as of January 1, 2023	$ 37 000	**$ 37 000**	Account balance as of 1/20/21
2023 Membership Dues Received	$ 14 000	$ 7 200	
Meeting registration fees - Spring Meeting	$ 4 000	$ 4 300	
Meeting registration fees - Fall Meeting	$ 4 000	$ -	
Total Projected Revenue	**$ 22 000**	**$ 11 500**	Actual YTD Revenues
Expenditures			
Scientific Paper	$ 4 000	$ -	
DE Franchise Tax Report - Report generation fees	$ 25	$ 25	
ANSI/ISO Initiative (AOCS - ISO TAG)	$ 2 900	$ 2 900	
Board Meeting Expenses	$ 600	$ -	
Spring Meeting Expenses (including speaker travel allowance)	$ 5 000	$ 5 000	est
Website hosting, maintenance, security	$ 500	$ 340	
Credit card processing and bank service charges	$ 300	$ 265	
Fall Meeting Expenses (including speaker travel allowance)	$ 4 000	$ -	
Graphic design material creation	-	-	
Marketing (Swag for 30yrs)	$ 300	$ 625	Swag/Banner
Subscriptions – conferences	-	-	
Miscellaneous	-	$ 37	
Total Projected Expenses	**$ 17 625**	**$ 9 192**	Actual expenses
PROJECTED BALANCE	**$ 41 375**	**$ 39 308**	Current Balance

AEIC 2022 Budget Summary

	Planned	Actual	
Beginning Balance as of January 1, 2021	$ 39,966	**$ 40,029**	Account balance as of 1/20/21
2022 Membership Dues Received	$ 7,050	$ 6,750	
Meeting registration fees - Spring Meeting	n/a	n/a	
Meeting registration fees - Fall Meeting	TBD	$ 4,650	
Total Projected Revenue	**$ 7,050**	**$ 11,400**	Actual YTD Revenues
Expenditures			
Scientific Paper	$ 2,000	$ 5,750	CWG Testing (Eurofins to be paid
DE Franchise Tax Report - Report generation fees	$ 25	$ 25	
ANSI/ISO Initiative (AOCS - ISO TAG)	$ 2,900	$ 2,900	
Board Meeting Expenses	$ 300	$ 300	Est
Spring Meeting Expenses (including speaker travel allowance)	$ 1,000	$ 500	
Website hosting, maintenance, security	$ 500	$ 230	
Credit card processing and bank service charges	$ 150	$ 258	
Fall Meeting Expenses (including speaker travel allowance)	$ 6,000	$ 3,720	Est
Graphic design material creation	-	-	
Marketing (Update and redo brochure/website)	-	-	
Subscriptions – conferences	-	-	
Miscellaneous	In Process	In Process	Fed Tax Exemption Status
Total Projected Expenses	**$ 12,875**	**$ 13,683**	Actual expenses
PROJECTED BALANCE	**$ 34,141**	**$ 37,746**	Current Balance

Ending Balance Trend (Short-term):



The Treasurer announced that non-profit status for AEIC was granted by IRS. A motion was made/seconded and voted positive to accept the Treasurer update.

Membership Update (L. Muschinske): The following table depicts the current membership composition of AEIC:

AEIC 2023 Member Summary				Updated:	3/1/2023
		Potential Dues	Unpaid	Amount Unpaid	
Large Corporate Members (1,000+ employees)	6	$ 6 000	1	$1 000	
Medium Corporate Members (50 to <1000 employees)	13	$ 6 500	10	$5 000	
Small Company Members (< 50 employees)	10	$ 2 500	5	$1 250	
Associate Members	3	$ 150	1	$50	
Individual Members	1	$ 100	0	$0	
		$ (750)			
TOTAL	33	$ 14 500	17	$7 300	

50% of the dues have been collected. One new member has joined: Prairie Aqua Tek dba Houdek Manufacturing.

Fall Meeting 2023: Several possible hosts indicated that they are checking on ability to host Fall Meeting: BASF/Syngenta (RTP, NC), Bayer (St. Louis) and Eurofins (Madison, WI). Dates will be determined by the Board with input from the host company.

Suggested topics: Crop focus on sugarcane/sugar beet or cotton; Generating antibodies; Protein production; Mass Spectrometry for proteins – characterization and analyses; New Technology such as next gen detection methods (nanoparticles); Regulatory process for GM animals.

Protein Working Group Updates (T. Geng/Bayer; C. Ament/Eurofins): The Protein Working Group (PWG) is co-chaired by Chis Ament (Eurofins) and Tao Geng (Bayer) The PWG currently has 5 active work streams (Multiplex Validation, MS for Protein quantification, Allergen Analysis, Extraction Efficiency, Intractable Proteins/Characterization). The **allergen analysis** work stream has 12 members who meet monthly and is working on the pepsin digestion assay. A manuscript draft outline is almost complete and describes further standardization of the method and improved reproducibility as well as recommended method specifications. The **multiplex validation** is preparing a first draft of a manuscript and is considering the possibility of doing two papers. The **MS for protein quantitation** The manuscript is in the final version stage. The **extraction efficiency** is discussing methodologies for establishing extraction efficiency. The whitepaper will soon be finished. The **intractable protein** group is working on a manuscript for protein safety assessment of intractable proteins. The PWG is also discussing "ambiguous results for protein methods" and whether this should be a standalone workstream or incorporated into another workstream. The PWG is also working on the update of the FAQ section on the AEIC website.

Composition Working Group (M. Bedair, Bayer): The group is working on ways to support acceptance of combustion (Dumas) vs the Kjeldahl method in the biotech industry for estimation of crude protein levels. The literature review is done. The CWG has collected samples for corn and soybean and have sent them to EPL and Eurofins for analysis. The group will map out the way forward to provide the necessary support for the combustion method (Dumas). The Dumas method uses non-corrosive chemicals and is capable of high throughput. The CWG is also looking at the natural variability for endogenous allergens in crops.

Nucleic Acid Working Group (M. Bennati, AgriPlex Genomics): The group has 24 members. The NAWG is discussing updating the AEIC website with latest technology information such as information on NGS methods, digital PCR, RT PCR, endpoint PCR, isothermal methods. A working group is addressing the updating of the website FAQ section. The group is also thinking on harmonization of nucleic acid analytical tests standards (ISO) and providing education to the public sector and regulators. Educational documents could include gene editing and PCR/qPCR.

Website Updates (D. Houchins, Romer Labs): Current slides on website are now on a google site for editing and are being checked for content and copywright of any of the content. A meeting with the other Working Groups is being planned for April to

discuss the slides. There was a suggestion that AEIC might want to create a LinkedIn page to reach more potential members. Now that AEIC has non-profit status, a Google drive for non-profits can be set up for information storage. Another suggestion was to offer members the ability to buy t-shirts with AEIC and its logo on them.

ISO Update (M. Sussman, USDA AMS): ISO has lots of groups working on similar things. ISO TC 215/S1 is working on genomics informatics. ISO TC 212 works on clinical lab testing and *in vitro* diagnostic test systems. ISO TC 276 is for biotechnology, bio-banking, bioprocessing, and data management. ISO TC 331 deals with biodiversity. ISO TC 34/SC 16 is the Biomarker Group which has 45 countries interested in its work. R. Shillito is the Chair, M. Sussman is the Committee Manager and D. Williams is the TAG Secretary. There are 8 WGs in TC34/SC16 which include: meat speciation, sub-sampling of seeds/grains, rapid nucleic acid amplification methods, biobanking for agriculture and food production, molecular biomarkers of agricultural fiber-cotton, microarray detection, genetically engineered content detection and quantification, single laboratory validation of qualitative real-time PCR. TC 34/SC 16 has 35 published standards, 11 of which are for identification of meat species. Standards being developed include biobanking for agriculture, guidelines for single lab validation of qualitative real-time PCR, DNA barcoding of fish and fish products and smart farming which is the modern use of information and communication technology. SC 38 is for textiles which has been looking at GM cotton detection. SC 93 is for starch.

NAICC (National Association of Independent Crop Consultants)(C. Ament, Eurofins): The NAICC meets January of every year and in 2023 celebrated 45 years. NAICC's key issues are: a) endangered species act and biological evaluation of pesticides for registration review; b) FIFRA revision and the Protect America's Children from Toxic Pesticides Act; c) EPA PRIA; d) IR-4 for minor crops; and e) resistance management. The next meeting will be in San Antonio in January, 2024.

AOCS (American Oil Chemists Society): International Standards Organization (ISO): For those interested in joining the ISO TC 34 subcommittees listed below, please contact Denise.Williams@aocs.org

- SC 16 SC 16 Horizontal Methods for Molecular Biomarker Analysis
  - WG8 Meat Speciation
  - WG 9 Subsampling of Seeds and Grains
  - WG 10 Rapid Nucleic Acid Amplification Methods
  - JWG 11 Biobanking Agriculture and Food Products
  - JWG 12 Molecular biomarkers of agricultural fibers
  - WG 14 Genetically Engineered Content Detection and Quantification
  - WG 15 Single laboratory validation of qualitative real time PCR
- SC 2 Oleaginous seeds and fruits and oilseed meals
- SC 11 SC 11 Animal and vegetable fats and oils

- SC 4 Cereals and pulses
- New Certified Reference Materials available: Visit Certified Reference Materials (CRMs) (aocs.org) for more information
  - Bayer CropScience MON 87419 maize (AOCS 0818-A2)
  - Bayer CropScience MON 87429 maize (AOCS 0321-A)
  - Bayer CropScience MON 94100 canola (AOCS 0421-A)
  - Bayer CropScience MON 95379 maize (AOCS 0521-A)
  - Nuseed NSB50027-4 canola (AOCS 0222-A)
- AOCS Annual Meeting and Expo, Denver, CO April 30 – May 3, 2023. Check out our 80+ sessions scheduled at AOCS Annual Meeting.
- COMING in Spring 2024: 8th Edition of Official Methods and Recommended Practices of the AOCS method book. Check out our digital and site license options!

The AEIC Business Meeting was adjourned.

INVITED TALKS

AEIC: The First 30 Years (P. Hunst, AEIC Secretary): At the 1992 EPA Immunochemistry Summit (Las Vegas), the discussion centered around the use of immunoassasys for regulatory testing of new chemical products. Several critical issues were identified that had to be addressed before immunoassays would gain acceptance: need for better communication among kit developers, users and regulators; need for standards and regulatory guidelines for acceptance of immunoassay data; need for educational programs for regulators and new users; need for policies to safeguard the quality of commercial immunoassay kits and applications that utilized the kits. EPA strongly suggested that the immunoassay industry take on these issues in order to be accepted. Industry took the challenge and late in 1992 held an organizational meeting at Dow Chemical in Michigan to define objectives, define the organization and establish committees. Another meeting was held in January, 1993 at Ciba-Geigy to define more objectives. In May, 1993 another group meeting was held at American Cyanamid to set up by-laws and get updates from group committees (Guidelines; Communication; Affiliations). In September, 1993, the Analytical Environmental Immunochemical Consortium (AEIC) was presented at the EPA Immunochemistry Summit. From 1993-1998, AEIC focused on immunoassays for environmental applications as an alternative to mass spectrometry. Workshops were held with EPA Office of Pesticides, EPA Office of Solid Waste and EPA Office of Water. The intent was to familiarize government scientists and regulators with immunoassay technology. In 1999 as agricultural biotechnology was rapidly developing in the U.S., the AEIC Biotech Committee proposed AEIC become more involved. The Biotech Initiative was proposed and accepted at the 1999 Spring Meeting. In 2005, a name change was proposed, i.e., keep the letters "AEIC" but have different words. The group settled on "Analytical Excellence through Industry Collaboration". The logo was also changed to reflect both protein and DNA detection methods. Since then, AEIC has focused on protein-based and nucleic acid-based detection methods. The membership also expanded to include analytical labs, seed

testing labs, equipment manufacturers, food and mycotoxin testing companies and GM trait providers. As in the beginning, education is still a pillar of the mission statement along with bringing "one voice" to regulatory authorities. AEIC has also been active in publishing detection papers/immunoassay papers since the beginning. AEIC has held meetings in 17 different states over the years. AEIC Board members have come from the Big 4 companies, kit providers, analytical companies, seed testing companies and grain companies.

Sorghum Research at Purdue (P. Rich, Purdue University): Sorghum is the 5th most important cereal globally. It is produced on 42 million hectares globally. The Great Plains of the U.S. is the largest producer where it was introduced in the 1700s. Sorghum has several crop advantages: drought/heat tolerance; lower input requirements; versatility; nutritional value; gluten-free alternative. It is primarily an animal feed (pigs/chickens) and has gained popularity as an alternative to wheat. Sorghum does have a high content of tannins. Sweet sorghum is a syrup similar to sugarcane syrup. It is sometimes referred to as "broom corn" as the stalks are used to make corn brooms. There is also pop sorghum which is similar to popcorn and energy sorghum which is tall and used for biomass. Moutai, a Chinese drink for special occasions, is also from sorghum. It is an important food crop in sub-Saharan Africa being used in flatbreads, porridge, and opaque beer. It also supplies silage for animal feed and the stalks are used in building materials. The constraints of growing sorghum in Africa include drought/water stress, pest/disease pressures, limited access to improved varieties, poor soil fertility, lack of mechanization for harvesting and climate change. Striga is a parasitic weed which is an obligate root parasite often called "witchweed". It infests maize, sorghum, upland rice and millet in Africa. It has caused 40% crop loss and affects 100 million people. There are two species: in sub-Saharan Africa and *S. asiatica* which is more widespread outside of Africa. Control of striga is afforded by the use of chemicals, biological agents, and agronomic practices (crop rotation; fallow land). Host resistance in sorghum varieties is complex and limited. Striga seed is small and may be viable for 20 years. When the seed germinates, haustoria form and attaches to host plant and eventually connects to the xylem. Striga must rely on the host for fixed carbon during its first 6 weeks underground. This affects the host plant hormone balance prior to emergence. Striga completes its life cycle in 10-12 weeks and produces 200,000 seeds/plant. The Purdue lab has identified mutants that vary in strigolactones they exude due to a deletion in chromosome 5, the LGSI gene. Different strigolactones are made—orobanchol and 5-deoxystrigol which do not function as germination stimulants. This would afford some resistance.

EU Decision Regarding Gene Editing (P. Jorasch, Euroseeds): Euroseeds has 52,000 employees with a 20% annual R&D spend and 750 stations and is the voice of the European seed sector. It represents the interests of those active in research breeding, production and marketing of seed for agriculture, horticulture and ornamentals.

Plant yield gain is slowing, climate change is occurring and pest pressures are increasing. Breeding is responsible for 66% of productivity growth and 1.16% of yield growth. EU embraces the farm to fork strategy to reduce inputs. EU may face 23%

productivity losses without more plant breeding. Breeding needs an evolving toolkit such as gene editing. In a 2018 ruling gene edited plants were proclaimed GMOs. In the EU Court of Justice, French organizations argues that herbicide tolerance by classical mutagenesis should be considered GM. The Court said all mutants are GM but those with a history of safe use be exempted. Gene editing was not exempted due to a lack of history of safe use. EU Member States had enforcement questions for gene editing and asked the European Commission for a study on new genetic technologies (NGT) developed after 2001. Study found that NGT contributed to sustainability and the farm to fork strategy. A policy initiative was started in 2021 with public and stakeholder consultations in 2022. A proposal is expected in 2023 with a policy decision in 2024. There may be a joint proposal in 2025-2026. Eighty percent of stakeholders want change. Court decision had severe effect on companies' R&D spend, i.e., moved R&D out of EU. Small and medium sized companies more affected since reliant on the EU system. More countries now implementing gene editing guidance such as U.S., Australia, Africa and Canada. Gene editing should be free of GM regulation.

Genetic Resistance to Fungal Pathogens in Sorghum (T. Mengiste, Purdue University): Pests and pathogens limit crop productivity. There is a need to expand the understanding of off plant disease resistant mechanisms and apply methods to enhance productivity. Climate change promotes diseases since the pathogen and insect rate of reproduction increase and expand into new areas. The host physiology also changes such that their predisposition to disease becomes greater. The lab at Purdue is exploring sorghum natural variation to identify resistant germplasm. Whole genome resequencing of biparental mapping populations from natural variants has been done. Foliar and grain diseases are major challenges like grain mold and Anthracnose. Grain mold is a complex of necrotrophic fungi nd is the most important disease globally for sorghum. Anthracnose is caused by Colletotrichum and is an important leaf/stem blight. Broader sorghum germplasm was screened for disease resistance which was incorporated into adapted materials. Molecular markers were generated. It was found that ARG2 and ARG4 genes from sorghum confer anthracnose resistance. Field resistance was found in 10 sites. RILS were developed for comprehensive mapping of disease resistance. There was clear cut resistant and susceptible plants. The DNA was sequenced and then mapped resistance locus by whole genome resequencing. Expression of ARG1 occurred in resistant plants but not in susceptible plants. ARG2 confers resistance to only particular anthracnose races. ARG4 and ARG5 are linked resistance genes.

Technology Spotlight: CRISPR (S. Chapelle, Sherlock Biosciences): Sherlock Biosciences was founded in 2018 to use the power of CRISPR for point of need diagnostics. The company has raised $111 million from leading investors and has exclusive rights to CRISPR and other molecules. The objective is ai driven assay design tools. The focus is on consumers and not just patients. The company wants to deliver PCR accuracy using antigen testing. There has been significant acceleration of new technology in the retail market which coincides with a convenience revolution in healthcare to deliver molecular diagnostics. Many potential applications through partnerships. Proprietary engineering biological tools form foundation of differentiated technology platforms.

One example is accurate detection of single base in a single molecule using amplification with CRISPR detection. Goal is a low cost disposable devise and reusable reader. Instrument-free molecular testing with gold standard quality. Beads in device carry reagents and amplification takes 3-4 minutes. CRISPR is rapid, portable, compatible with crude samples and allows real-time multiplexing with expanded enzyme functionality. More work is needed on sample collection and standardization.

Prussic-acid Free Sorghum Creates New Opportunities for Hay and Silage Production (M. Tuinstra, Purdue University): Dhurrin is a cyanogenic glucoside of sorghum that accumulates to high levels in young tissues. It negatively impacts the use of sorghum tissues for forage and feedstock. There is potential for cyanide production from prussic acid. Pathway is well known. The enzyme dhurrinase breaks down dhurrin and produces free cyanide. There is variation in dhurrin accumulation due to genetic variation of plants. Genetic markers for genes in pathway were developed. Knockouts were produced which did not produce cyanide. This provides hope for dhurrin-free sorghum. Shut off of dhurrin path affects the growth rate of plants, i.e., grow faster. There were no negative effects in the trials and levels were reduced when making hay. It was found that rumin fluid from animals facilitates release of cyanide in hay. Plants that do not produce dhurrin are preferentially fed on by animals. Dhurrin-free sorghum is being commercialized in collaboration with S&W Seed Company.

Sorghum Commercial Breeding (P. Burks, S&W Seed): S&W Seed has breeding stations in Lubbock and Victoria, TX. Having a molecular lab in Lubbock cuts the time for bringing a variety to market. Lubbock site also has 60 acres for research and 16 out-lying yield sites. 3000 varieties are made per year. The market concentration is in Kansas and the Rio Grande Valley. Farmers are interested in feedstock and there is lots of diversity in forages (BMR, conventional, PPS, sudans). Silage and forage more accepted. There is farmer pessimism around sorghum due to weed/insect control challenges, yield disadvantage. Farmers like easy and do not like challenges. Sorghum seed prices are cheaper than other crops ($180/bag). Sorghum is great for rotation, double crop and emergency crop and does great on marginal ground. To gain acres, must improve adaptation, reduce impact of environmental stressors and consider new markets. Sorghum value could be increased by yield and agronomic improvements as well as hybrid traits. Prussic acid-free sorghum will impact industry for grazing by extending the grazing window. Trait is adaptable and will be accepted internationally.

Quantitative Method for Variant Analysis for Determination of Genetic Trait Purity (S. Islam, ICIA): Genetic purity is the degree of seed contamination caused by unwanted genetic varieties or species. Purity may be determined by phenotyping, i.e., grow-out testing to observe plant phenotype. It can be done biochemically using isoelectric focusing, SDS-PAGE, westerns, ELISA, LFS. It can also be done genotypically with the use of Southerns and PCR. A DNA-based system has been developed at ICIA which uses a SNP. The SNP has been identified for the mutation C493Y. Quantitative real-time PCR was attempted, however, it could not discrimate between wild type and dhurrin-free sorghum. The SNP was found to be in a high GC region of the DNA. Pyro-sequencing was also attempted for dhurrin-free sorghum detection using real-time quantitative

DNA sequencing. However, this technology is becoming obsolete. A next gen sequencing (NGS) was then developed. DNA is extracted and standard samples are prepared by spiking. The assay is then run and results are read. There are broad applications for traits from SNPs, small indels, stacked traits and native vs gene edited traits.

Pathogen Assay Validation (A. Eads, Agdia): Agdia was founded in 1981 with potato virus X assay as a foundational product. These assays were validated to customers' needs. Technology Support started in 2014 due to customer inquiries about validation. Requests for validation reports to meet ISO 17025 started in 2018. Validation reports are done on demand and guidance from EPPO PM7/98 and ISO TS 16393 was used to prepare reports. For these reports, the quantity of data was variable and historical data had to be used for PVX assays. Reports are created for all assays and have identified categories to be included. In the more recent reports, more data is collected; there is a more direct focus on validation requirements; and are now filling the gaps where no plant pathology regulatory requirements exist. The limitations for validation are reference materials, time of year for growing plants, foreign regulations and lack of U.S. standardization. External validations are done via ring trials. APS DAVN is a NIFA funded organization for diagnostic development and validation. It has tools for assay developers and prepares diagnostic assays for multi-lab ring trials. The customer benefits of assay validation include more data, transparency, availability of documentation and confidence in assay. It also allows open dialog with the customers so they can convey their needs/wants especially for newly emerging pathogens.

Bill & Melinda Gates Agricultural Innovation (C. Dharmasri, Gates AgOne): Smallholder farmers must have same opportunities to thrive. If yield increases, this allows smallholder growers to be able to sell some of their crop to help feed their families. Hunger is seasonal for smallholder families. Bill & Melinda Gates Agricultural Innovation helps accelerate crop innovations for smallholder growers. The organization is located in St. Louis and embraces a startup mentality. The demand for smallholder grower innovation is high. Yields in Africa are only 15-20% of other agricultural regions. The organization is focusing on plant biology. Public sector researchers lack experience in bringing products to market. The Gates AgOne organization takes a collaborative leadership approach by using crowd sourcing of diverse expertise and then build local capacity for the long term. All lives have equal value and the smallholder farmer is at the center. Collaborative innovation unlocks new partnerships to streamline and yield transformative products. These increase value and accelerate progress. The focus crops are cassava (nutrition), cowpea (protein) and soybean (protein). Second tier crops are maize, rice and sorghum. Cereal crops are the dietary energy source and provide up to 25% daily protein. Discovery partner projects include carbon fixing photosynthesis, nitrogen fixing bacterial symbiosis and carbon assimilation, i.e., boosting cassava yield. Gates AgOne is looking for partners to assist with needed lab competencies such as construct design, vectoring/cloning, transformation, diagnostics, molecular analysis, trait testing, genotyping, protein production, protein diagnostics, insect bioassays, mode of action studies, regulatory science studies, etc.

Future of Alternative Proteins (S. Simsek, Purdue University): Plant-based meat is produced from plants and is composed of protein, fat, vitamins, minerals and water. The next generation plant-based meat looks, cooks and tastes like conventional meat. It is projected that there will be increased demand for plant-based meat by 2030. There will also be demand for plant-based fish and dairy products. Singapore leads countries in putting new products on the market quickly such as plant-based chicken nuggets. The market drivers include market analysis, consumer insights, ingredient formulation, processing choice and product launch. The challenges for alternative meat include regulations, industry policies, supply chain disruptions, cost, safety, nutrition, sensory properties, ingredients, function and labeling. Product development must consider flavor, texture, sustainability, binders/moisture, nutrients/protein quality, color, fat/melting properties and a "clean" label, i.e., less chemical names. Purdue University has a pilot plant (9500 sq ft) which is equipped with state of the art mechanization such as a pilot scale extruder.

Discover Benefits of a New Winter Oilseed Crop (C. Aulbach, CoverCress): Fossil fuels contribute to greenhouse gas emissions which contribute to global warming. Fossil fuel use can be reduced by the use of electric vehicles and the use of renewable diesel. Soybean oil has been used for renewable fuel but it is not sustainable. New crops for renewable fuels should not compete with food/feed demands. CoverCress is from the field pennycress plant and is grown in rotation with corn and soy. The oil content is 30% with the nutrition being similar to canola oil. Approximately 1300-2000 lbs/acre are harvested in May. It is planted in the fall and must vernalize like wheat. The plant matures in the spring so that a follow-on crop can be planted in May. The company contracts with farmers to grow CoverCress and works with grain handlers to clean and store seed. The meal is used for animal feed. The company is a startup by former Monsanto employees with the objective to develop and introduce a new crop. It was originally a venture capital company but is now owned by Bayer, Bunge and Chevron. There is a potential market of 30 million acres in U.S. The addressable market is 10 million acres and the target market is 3 million acres in 10 years. Bunge will be doing the crushing in a new plant that is being converted for the crop. CoverCress is sensitive to HPPD herbicides so considering putting tolerance in plants. Currently, the glucosinolates in the plants protect them from insects. The plants were gene edited for low fiber, low erucic acid and low sinolates. Yield is 45 bushels/acre but the oil production is greater than soy.

Metabolomics and GMO Risk Assessment (M. Bedair, Bayer): The development of a GM crop takes time—13 years and $136 million. Event selection and commercial breeding into elite germplasm ensures efficacy, safety and minimum unintended effects. Composition studies must contend with growth conditions, which components/crop to assess and the results interpretation. There will always be statistical differences but these most often do not mean there is a safety concern. Generally, analysis is done on minerals, anti-nutrients, carbohydrates, proteins, fat, endogenous allergens, etc. Validated methods from official method sources are used. Differences come from the environment and the germplasm. In 2021, CropLife International published a paper proposing a hypothesis-driven compositional safety assessment. The

use of omics (genomics, transciptomics, metabolomics) provides global analysis of a biological system. Omics is great for biomarker discovery and mode of action of a new compound. Omics are not yet ready to be used in safety assessments. EU EFSA conducted analysis of omics for safety assessments but was split on whether to replace the current endpoint strategy. More compounds can be analyzed but this is not necessarily useful for safety assessment. For crop variety selection, if a difference is understood then there should be no further testing. If the difference is not understood, then a safety assessment is needed. However, the difference cutoff is not defined and the one class model has limitations. Structural elucidation is a major challenge for the interpretation of metabolomics data to understand a biological system. Omics needs include tools for interpretation of data, major advances in mass spectrometry analysis, alignment of metabolomics method that captures diversity of the plant metabolome, and standardization of metabolomic methods. Omics is great for discovery but targeted assays are great for regulatory purposes.

Special Topic: AEIC Training Opportunity (Group): Technology training sessions for scientists in Africa are needed to help them learn about protein analysis. Training of government scientists is needed initially. Should AEIC do? Ray Shillito may be willing to consult on this. Romer Labs has some training expertise in the parent company DSM. AEIC needs to know if the training would be onsite within Africa and what would be the timeframe for training. What type of protein analysis is needed and for what purpose. The objectives of the training need to be known before AEIC can commit. A sub-group will organize a call in April to work out some of these specifics.

2023 Spring Registrants:

Name	Organization
Ament, Chris	Eurofins Food Chemistry Testing
Atkinson, Tara	Corteva
Balvin, Kevin	SGS NA
Bedair, Mohamed	Bayer
Benatti, Matheus	Agriplex Genomcis
Brix, Kalyn	SoDak Labs
Brown, Gregory	Bayer
Calcaterra, Jennifer	Bayer
Capp, Danielle	SGS NA
Chamberlain, John	EnviroLogix
Cheever, Matt	BASF
Dharmasri, Cecil	Gates Ag One
Eads,Alex	Agdia
Gadola, Mary	Neogen
Geng, Tao	Bayer
Ghavami, Farhad	Eurofins BDI
Gillikin, Nancy	BASF
Gunasekara, Dulan	BASF
Haudenshield, James	Merieux NutriSciences
Houchins, Donna	Romer Labs
Hunst, Penny	AEIC
Islam, Shofi	ICIA
Kenward, Kimberly	20/20 Seed Labs
Kouba, Kristen	Corteva

Kraft, Caitlin	Eurofins Agriscience Services
Lane, Gillian	Eurofins Agriscience Services
Lewis, Sean	Eurofins Agriscience Services
Makani, Mildred	Syngenta
Mehlhaf, Jordan	Houdek Manuf.
Mitchell, Carter	Kemp Proteins LLC
Muldoon, Mark	Romer Labs
Muschinske, Luke	Eurofins Microbiolgy Labs
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Serrano, Hector	BASF
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Song, Feng	Syngenta
Spiegelhalter, Frank	Eurofins GeneScan
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Tapley, Susan	EnviroLogix
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Vigeolas, Helene	BASF
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Wang, Yanfei	Bayer
Wang, YongChen	Bayer
Whitt, Sherry	BASF
Williams, Denise	AOCS
Wu, Pei-Ying	BASF
Zhang, John	Corteva
Zheng, John	ICIA