ALES GSA presents

ALES RESEARCH SYMPOSIUM 2023

March 28 & 29, 2023

ENGINEERING TEACHING AND LEARNING COMPLEX (ETLC)
ROOMS E6-012 & E6-015

7th Annual Graduate Research Symposium of the Faculty of Agricultural, Life & Environmental Sciences

University of Alberta, CA
28th March – 29th March, 2023

Book of Abstracts

UNIVERSITY OF ALBERTA

Agricultural, Life & Environmental Sciences
Graduate Students' Association

Contents

Territorial Acknowledgement

The University of Alberta, its buildings, labs, and research stations are primarily located on the traditional territory of Cree, Blackfoot, Métis, Nakota Sioux, Iroquois, Dene, and Ojibway/Saulteaux/Anishinaabe nations; lands that are now known as part of Treaties 6, 7, and 8 and homeland of the Métis. The University of Alberta respects the sovereignty, lands, histories, languages, knowledge systems, and cultures of First Nations, Métis and Inuit nations.

Learn more: What is a land acknowledgement

Welcoming Message from Stan Blade, Dean of Faculty of ALES

Dear ALES Graduate Research Symposium participants and attendees,

I am proud to welcome you to the seventh annual ALES Graduate Research Symposium. Research is an important part of your graduate experience, and it also contributes innovative solutions that can improve the world around us. As graduate students, you are addressing challenges in agriculture, food science, human ecology and resource economics — all of which impact our daily lives. I commend your efforts, and thank you for sharing your results and enthusiasm through events like this one.

While graduate research can be rewarding, I know it isn't easy. Before you got here today, you likely conducted many tests and experiments, or may have had days where your results weren't what you expected. Many of you are also working, parenting, and pursuing goals beyond academia. ALES faculty and research staff are behind you every step of the way. We've been there and we're here for you. Keep up the good work and soak up the recognition you earned at the symposium.

On behalf of ALES faculty and staff, I thank the ALES Graduate Student Association for hosting this event, and for your ongoing support of ALES graduate students. Your dedication to your fellow students, in addition to your studies and research, exemplifies the university's commitment to uplifting the whole people. I hope you enjoy the symposium, and I wish you well for the remainder of the semester.

Stanford F. Blade, PhD
Dean, Faculty of Agricultural, Life & Environmental Sciences

Welcoming Message from Bingxin Hai, ALES GSA President

Welcome to the University of Alberta's ALES Research Symposium 2023! The symposium is an annual celebration of graduate research, showcasing the scientific accomplishments of graduate students across various disciplines in the Faculty of ALES. ALES Research Symposium 2023 aims to offer graduate students a platform to present their research and network with professionals and peers, ultimately, inspiring innovation by facilitating an exchange of knowledge across a wide breadth of global challenges.

This year marks the 7th anniversary of ALES Research Symposium. Not only are we celebrating the return of an in-person conference (after two years of successful virtual conferences due to the COVID-19 pandemic), but we are also thrilled to host the largest symposium in its 7-year history. The number of oral presenters is more than doubled compared to last in-person symposium in 2020! It is clear that despite the challenges of recent years, enthusiasm for graduate research and science communication continues growing.

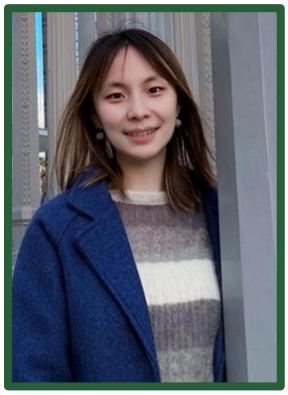
As the President of ALES GSA, I would like to acknowledge and commend all my Executive Team members for their hard work and perseverance in putting together a conference of this scale. To all the sponsors, partners, presenters, judges, and attendees: your participation and support motivate ALES graduate students to strive for excellence and encourage future generations of researchers. ALES Research Symposium 2023 would not be possible without the support, participation, and expertise of the ALES community.

The ALES GSA Team hopes you enjoy the symposium and come away inspired by the diverse and meaningful contributions ALES graduate students are making to support a brighter future.

Sincerely,

Bingxin Hai
ALES GSA President

The ALES GSA 2023 Organizing Committee



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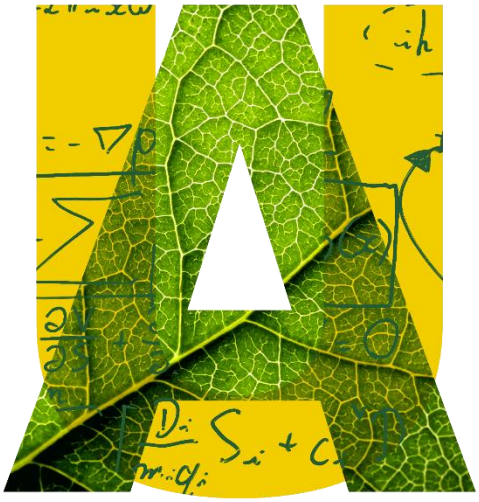

Thank you to the following ALES departments for supporting the ALES GSA Research Symposium:

- Agricultural, Food & Nutritional Science
- Human Ecology
- Renewable Resources
- Resource Economics and Environmental Sociology

Thanks as well to our other U of A partners:

- Faculty of Graduate Studies & Research
- Graduate Students' Association
- Faculty of Engineering

Special thanks to:

- All faculty who have generously volunteered their time to judge posters and presentations throughout the event.
- Dr. David C. Bressler and Dr. Rene Dery, from the Faculty of ALES, Sam Fedun, Ivannia Halls, and Kevin Heidebrecht from the Faculty of Engineering, for their support in space booking and setup.
- Byron Flores, Shelby MacLeod, from the Faculty of ALES, for their support in promoting the event.
- Patrick Phillips, and his team at Supply Management Services, for their support with logistics for the poster session.
- Office of the Dean of Students for their support with multimedia equipment
- Courtney Bangen, from Horowitz Events Centre, and Tim Hortons for assistance with catering
- All of the graduate researchers and mentors who have contributed to enriching a culture of multidisciplinary research at the Faculty of ALES.

External organizations:

- Garneau Chiropractic Health Clinic

Information

Symposium:

The Faculty of Agricultural, Life, & Environmental Sciences Graduate Research Symposium 2023 runs from 9:30am to 3:30pm on March 28 and 29, 2023 on the sixth floor of the Engineering Teaching and Learning Complex (ETLC). There will be several breaks throughout the session (see program overview).

Lunch & Refreshments:

Refreshments (coffee, juice, water) and snacks (cookies, TimBits®) are available throughout the event. They may be found outside of ETLC E6-015.
Lunch (vegetarian options available, no vegan) will be provided on both days of the symposium. They may be found outside of ETLC E6-015.

Speakers:

Speakers and presenters are expected to check in at the front desk in front of ETLC E6-015 and receive their name tags prior to the start of their session.

Oral Presentation Guidelines:

Each oral presentation is 10 minutes plus 5 minutes for questions. All oral presentations are to be held in ETLC Room E6-015.To ensure a smooth transition between presenters, all oral presenters are expected to be present in the room for the entire duration of their session.
Due to the set up of the room, there will be no presenter notes available during the presentation. Instead, presenters will be able to view their slides on the projected screen. All presenters are welcome to bring their own presenter notes.
Please note that no personal devices should be connected to the projector. A presenter may choose to bring a copy of their presentation on a flash drive should there be technical issues. Presenters are welcome to pre-view their slides any time during the session breaks.

Poster Presentation Guidelines:

Poster presentations will be held in ETLC E6-012 at 1:15 pm - 2:15 pm on Tuesday, March 28, 2023. All poster presenters must be present for the entire duration of the poster session.

All posters must be hung up by 11:30 am so that they can be viewed over the lunch break. Poster sizes are 36” x 48” and may be in either landscape or portrait format. The poster boards available are 48” tall and 72” wide.

Student Prize Competition:

All students who submitted an abstract for presenting are automatically enrolled into the student competition for best presenters. Winners will be announced after the symposium.

Award prizes are as follows:

Oral presentations:
1st place: $200
2nd place: $100
3rd place: $50

Poster presentations:
1st place: $200
2nd place: $100
3rd place: $50

People's Choice for Poster: $50

People's Choice for Poster:

Except for poster judges, everyone who attends the event may vote for their favourite poster on the first day of the symposium during poster session at 1:15pm – 2:15pm. Voters may choose to enter their names and contact information on the ballot to be included in the draw for door prizes.

Door prizes:

During the closing ceremony of the event, there will be 3 door prizes of $50 gifts cards to be won. Three winners will be selected for a lucky draw when they cast their ballots for the People's Choice for Poster. Winners must be present to receive the door prize.

Contact:

Any questions regarding the event can be directed to alesgsa@ualberta.ca.
During the event, questions may also be directed to any of the executive team members wearing an "ALES GSA Executive" nametag.

Programme Overview

Tuesday, 28 Mar 2023

Oral Presentations (ETLC E6-015)	
9:30-10:00	Check in/Welcome and Opening
10:00-10:15	Chathuranga De Siva "Belowground nitrogen transfer from legumes to non-legumes under drought stress"
10:15-10:30	Sumedha Vaishnavi Nallanthighal "Effect of humalite for enhancing crop production and as a soil amendment for improving soil health"
10:30-10:45	Kirra Kent "The contributions of spiders as biological control agents in canola"
10:45-11:00	Carina Lopez "Contarinia nasturtii and Arabidopsis thaliana as a model system to study gall insect-plant interactions"
11:00-11:15	**Break**
11:15-11:30	Huiqi Wang "Renewable fatty acid-based polymeric micelles for targeted drug delivery"
11:30-11:45	Muhammad Anjum "The use of bioplastics in food packaging – current and future prospects"
11:45-12:00	Shaelyn Xu "The Social Event at the Air-Liquid Interface: A Functional Genomic Analysis on Biofilm-related Genes during Pellicle Formation by Escherichia coli and its Interaction with Aeromonas australiensis"
12:00-12:15	Montserrat Montes de Oca Ibarra "Prevalence and clinical implications of abnormal body composition phenotypes in patients with COVID-19: a systematic review"
12:15-13:15	**Lunch / Poster Session (ETLC E6-012)**
13:15-14:15	**Poster Session (ETLC E6-012)**
14:15-14:30	Karly Coleman "Formulations, frames, and precedents: Unmaking history in public meetings"
14:30-14:45	Elham Kaviannasab "Optimizated Electrospinning Conditions for the production of a Chemical and Biological Protective Nanofibrous Membrane Made of Polyacrylonitrile Embedded with Magnesium Oxide"
14:45-15:00	Josephine Bolaji "Wear trial assessment of customized bras made using a newly developed bra fitting method"
15:00-15:15	Qi Wang "Unbecoming Human To become more Human - A Posthumanist Perspective on the Female Footbinding Phenomenon"
15:15-15:30	Shakil Mahmud "Parameters affecting the Measurement of the Efficiency of Joule Heating Textiles"

Wednesday, 29 Mar 2023

Oral Presentations (ETLC E6-015)	
9:30-10:00	Check-in/Welcome and Opening
10:00-10:15	Hector Perez Marquez "Use of Drinking Behavioural Biometrics in Combination with Orbital Infrared Thermography for the Early Detection of Bovine Respiratory Disease (BRD) in a Spontaneous Model"
10:15-10:30	Emily Depaoli "Understanding how laying hen strain impacts perching biomechanics and keel bone damage in enriched-housed laying hens"
10:30-10:45	Camila Schultz Marcolla "Cecal microbiota of broilers and layers raised in the same environmental"
10:45-11:00	Camila Rodrigues de Freitas "Response of different broiler breeders' BW trajectories on the offspring performance"
11:00-11:15	**Break**
11:15-11:30	Ananya Sarkar "Silicon ameliorates clubroot responses and modulates the phytohormones in canola (Brassica napus L)"
11:30-11:45	Aldo Ríos Martínez "Effects of semi-natural vegetation on the assemblage and functional diversity of arthropods in canola fields"
11:45-12:00	Fernando Guerrero Zurita "Identifying superior photosynthetic efficiency traits in canola Brassica napus gene pool"
12:00-13:00	**Lunch**
13:00-13:15	** Cancelled **
13:15-13:30	Nageshwari Krishnamoorthy "Effect of feedstock type and pyrolysis temperature on seeding characteristics of biochar for struvite crystallization"
13:30-13:45	Andrii Oleksandrenko "Americium-241 in peat bogs as a global marker of the beginning of the Anthropocene: examples from Europe and North America"
13:45-14:00	Sundas Butt "Impact of dust dissolution on the dissolved fraction (<0.45 µm) of trace elements (TEs) and their size-based distribution in peatland waters in the Athabasca Bituminous Sands (ABS) region"
14:00-14:15	**Break**
14:15-14:30	Yu Wang "Impact of filtration on the concentrations and size distribution of dissolved trace elements in surface waters"
14:30-14:45	Iram Afzal "Investigation of biodegradation of hydrocarbons under different redox conditions in oil sands tailings to mitigate methane emissions"

14:45-15:00	Sunny Choi “Chronic toxicity and bioaccumulation of trace elements in daphnids exposed to water and sediment from an oil-sands tailings pit lake”
15:00-15:15	** Cancelled **
15:15-15:30	**Closing Remarks**

Poster Presenters and Titles

Poster board #	Presenter & Title
1	Maria Guadalupe Robles Hernandez "Novel use of bacillus fermentation and sourdough to improve bread volume and storage life"
2	Reihane Taheri "A randomized controlled trial to assess the efficacy of fish oil supplementation to improve impaired non-fasting lipid metabolism in youth with obesity"
3	Shengjuan Li "Effect of modulation of auxin response on clubroot disease development in Arabidopsis roots"
4	Danielito Dollete "Effect of drought stress on growth, symbiotic nitrogen fixation, soil nitrogen availability, and soil health parameters in forage legumes"
5	Jacey Toerper "The performance and stability of spring wheat cultivars mixtures in contrasting management conditions in western Canada"
6	**Cancelled**
7	**Cancelled**
8	Tianyi Zhao "Effects of humic-based soil amendment on alleviating drought stress in canola (Brassica napus L.)"
9	Bernardo Araujo Souto "Lipids as Feedstock for Sustainable Aviation Fuel Production"
10	Nanzhen Qiao "Comparative genomic analysis of Periweissella and the characterization of novel motile species"
11	**Cancelled**
12	Michele Tran "Non-native Cicer milkvetch effects on soil microbiome and ecosystem goods and services on Canadian dry mixedgrass prairie"
13	Etseoghena Obi "Effects of maternal growth strategies on hatching parameters and broiler performance"
14	Peter Isesele "Reducing Chemotherapy Induced Inflammation in Colorectal Cancer: The Benefits of Long-Term Dietary fish Oil in a Preclinical Model"
15	Simranjeet Kaur "Nested Association Mapping to Identify Stripe Rust Resistance QTLs and their markers in Spring Wheat"
16	**Cancelled**
17	Arawe Gedara Nadeesha Samaraweera "Looking for visible signs of changes in polyimide films after hydrothermal aging"

18	Anita Amir Labonno “Optimized UV-protection for the antimicrobial finish on protective clothing”
19	Jemma Forgie “Stopping smoke before it reaches the skin: Production of aramid nanowebs to protect against smoke-produced carcinogens in firefighter protective clothing”
20	Surabhi Lukose “Studying the potential for density management to moderate drought effects in coastal plantation forests of British Columbia”
21	Camila Camara de Almeida Cardoso “Using archived soil samples to examine carbon sequestration after 20 years of conservation tillage in Alberta, Canada”
22	Priscillar Wenyika “Exploring the Agronomic and Soil Health Benefits of Liming in the Canadian Prairies”
23	Mohammad Khodaei “Vermicompost and biochar affect soil respiration, microbial biomass C and N, and microbial function in agricultural soils from central Alberta”
24	Roya Faramarzi “How can microbial diversity be used as an indicator of soil health in different land management conditions”

Oral Presentations

Abstracts are presented in the running order of the programme.

Belowground nitrogen transfer from legumes to non-legumes under drought stress

Chathuranga De Siva, Malinda Thilakarathna

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Legumes have long been incorporated into agriculture for their ability to enrich soil nitrogen (N) through symbiotic N fixation (SNF) and their benefits in sustainable agriculture. Although intensive research has been carried out to understand how drought affects SNF, only a few studies have examined belowground nitrogen transfer (BNT) from legumes to non-legumes. BNT is a rhizosphere process involving complex metabolic reactions carried out by plants and the rhizosphere microbiome. To test the hypothesis that BNT from legumes to non-legumes is affected by drought stress, this study proposes a combination of several approaches, including agronomic, metabolomic, and metagenomic analysis of key legumes' response to induced drought. To gain insight into different mechanisms associated with BNT, alfalfa and smooth bromegrass will be grown in a mixed stand in greenhouse conditions, and BNT will be evaluated using isotopic (15N) labeling techniques, following the exposure to drought stress. To determine the root exudate dynamics under drought stress, legumes and non-legumes will be grown in a mixed stand in a semi-hydroponic system, where root exudates will be collected and analyzed using high-performance liquid chromatography-tandem mass spectrometry, and metabolic signatures associated with drought will be identified. Diversity and shifts in microbial community composition under drought will be analyzed using a next-generation sequencing approach to identify the operational taxonomic units. The findings of this multi-approach study will provide a better understanding of the exudate dynamics, molecular mechanisms, and microbiome dynamics associated with BNT from legumes to non-legumes, to be utilized in more sustainable, nitrogen-efficient agriculture practices.

Keywords: Legumes, Intercropping, Belowground nitrogen transfer, Root exudates, Metabolomics, Metagenomics

Effect of humalite for enhancing crop production and as a soil amendment for improving soil health

Sumedha Vaishnavi Nallanthighal, Karanjot Gill, Malinda Thilakarathna, Linda Gorim

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Nitrogen fertilizer application increases crop yield by improving growth, but it's excessive use may lead to extra production costs, increasing risks of nitrate leaching contaminating groundwater and also reduce the nitrogen use efficiency (NUE) of crops. Hence, identifying on-farm solutions to increase the NUE while reducing N-fertilizer input is important. Humalite is a naturally occurring humic substance containing high humic acid content and is increasingly being used as soil amendment as they seem to improve soil nutrient availability, nutrient uptake, crop growth, buffer drought stress and improve crop yield and nutritional quality. A field study was conducted at four sites and three soil zones in Alberta to evaluate humalite application as a strategy to promote yields and soil health. The objectives of this study were: (a) to assess humalite effects on different agronomic and soil health indicators, and (b) to evaluate whether humalite application can lead to reduced urea application rates. At four sites, five humalite and three urea application rates were assessed in a split-plot design with wheat (2021) and canola (2022). Agronomic and soil data was collected and analysed. Results indicate that each site showed significant differences in yield parameters with different urea and urea-humalite interaction rates. 200-400lbs/ac of humalite seemed to provide higher agronomic influence compared to other rates. No clear pattern of humalite effect on soil health was observed in Year1. Results from Year2 indicate an increase in microbial respiration, microbial biomass and soil pH and a reduction in nitrate concentration and active carbon. This project seeks to provide producers with a naturally occurring product that will have both financial and environmental benefits.

The contributions of spiders as biological control agents in canola

Kirra Kent, Aldo F. Ríos Martinez, Jaime Pinzon, Boyd A. Mori

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Spiders make up a large proportion of agroecosystem predators, yet little is understood about their specific roles, community composition, and predator-prey interactions in these systems. Understanding the precise nature of these relationships can inform management decisions to effectively use spiders as naturally occurring biological control agents against economic pest species. To characterize these interactions, both taxonomic and functional diversity will be assessed.

In the previous two sampling years few spider representatives were captured in pitfall traps relative to other predators, despite spiders being observed in the field. This may be due to low abundance, spiders' propensity for escape, or the niche of large predators being filled by other groups. To overcome this, a modified trap design will be tested, with the goal of improving the retention rates of all spiders, particularly those smaller than 5 mm, without using a fluid preservative.

Taken collectively, this research will further our understanding of the differential niche contributions of representative spider species abundant in the canola agroecosystem. Additionally, the modified trapping regime will provide novel insights into improving the passive-live collection of challenging-to-capture taxa.

Contarinia nasturtii and Arabidopsis thaliana as a model system to study gall insect-plant interactions

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Invasive species are a significant threat to biodiversity and ecosystem function. In Canada, the invasive swede midge (Contarinia nasturtii) is a pest that threatens agricultural production of plants in the Brassicaceae. Midge larvae manipulate their host plant to create galls—abnormal plant tissue deformations produced in response to salivary secretions—which can cause yield losses up to 85% in Brassicaceae crops. A model system to understand the mechanisms involved in host plant selection and manipulation by this insect pest would enhance our knowledge of this pest and possible management strategies. This project aims to develop a model system with C. nasturtii and Arabidopsis thaliana wherein insect-plant interactions can be thoroughly studied. This unique system will explore the plant signaling pathways and defense responses that are manipulated by the midge. Specifically, the objectives of this project are 1) To investigate the life cycle and biology of C. nasturtii on A. thaliana, and 2) To investigate the manipulation of host plant pathways using defense-related mutant lines of A. thaliana relevant to insect-plant interactions. Ultimately, this study will begin to elucidate the mechanisms of midge manipulation of the plant and the role of plant defense compounds in response to C. nasturtii.

Renewable fatty acid-based polymeric micelles for targeted drug delivery

Huiqi Wang, Aman Ullah

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Polymeric micelles are nanosized structures formed by self-assembly of amphiphilic block copolymers in aqueous solution. They are one of the most efficient drug delivery systems because of their ease of preparation, chemical flexibility and size advantages. Fatty acids, naturally occurring hydrophobic lipid components with good biodegradability and biocompatibility, are attractive alternatives to some fossil-based polymers for the fabrication of block copolymer micelles. Herein, we report the preparation, characterization and testing of block copolymer micelles composed of renewable fatty acid based hydrophobic block and thermoresponsive hydrophilic block for controlled drug delivery. The block copolymers of functionalized fatty acid and poly(N-isopropylacrylamide) (PNIPAM) were prepared via consecutive microwave-assisted reversible addition fragmentation chain transfer (RAFT) polymerization within 25 minutes. The results indicated that these amphiphilic block copolymers with variable block lengths could spontaneously self-assemble in aqueous media and formed spherical nanoparticles of ~30 nm with low critical micelle concentration (CMC). Carbamazepine (CBZ) was used as a hydrophobic model drug to evaluate the performance of these micelles as drug delivery systems. The in vitro drug release tests were carried out below (25 ^{o}C) and above (37 ^{o}C) the lower critical solution temperature (LCST) of the block copolymer. The drug release showed obvious temperature-triggered response and a sustained drug release rate with complete release of drug within 72 h at 37 ^{o}C. These findings suggest the opportunity to further explore the utilization of renewable materials as replacements of synthetic materials for intelligent delivery systems.

The use of bioplastics in food packaging – current and future prospects

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More than 90% of all man-made materials are petroleum-based and non-biodegradable, and plastic output has surpassed that of most other materials. The biggest consumer of plastic and the biggest source of municipal solid waste is packaging, particularly food packaging. Additionally, the plastic sector is unsustainable due to its reliance on crude oil as a feedstock, and the plastic market is unstable due to oil prices. The food packaging sector is now putting a high priority on the development of bio-alternatives to traditional plastics. Biodegradable or biobased (wholly or partially) polymers, as well as those that are both, are referred to as bioplastics. With an emphasis on food packaging applications, this seminar will present an informed overview of the most recent research and development breakthroughs in bioplastic materials. Regarding their mechanical, thermal, and barrier features, bioplastics are contrasted with their conventional counterparts. The possibilities for enhancing bioplastic characteristics to increase the applications for food packaging will also be properly examined.

The Social Event at the Air-Liquid Interface: A Functional Genomic Analysis on Biofilm-related Genes during Pellicle Formation by Escherichia coli and its Interaction with Aeromonas australiensis

Shaelyn Z. Xu, Tongbo Zhu, Zhiying Wang, Xianqin Yang, Michael G. Gänzle

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Pellicles are biofilms that form at the air-liquid interface. Pellicle formation has been well studied among gram-positive bacteria, but not in gram-negative bacteria such as Escherichia coli or its cocultures with other bacterial species. We demonstrated that specific strains of E. coli formed pellicles in single cultures, when cocultured with Carnobacterium maltaromaticum and E. coli O157:H7 but not with Aeromonas australiensis. Therefore, a combination of comparative genomic, mutational and transcriptome analyses were applied to identify the unique genes in pellicle formation and investigate gene regulation under different growth phases. Here we report that pellicle forming strains do not harbor unique genes relative to non-pellicle forming strains; however, the expression level of biofilm-related genes differed, especially for the genes encoding curli. Further, the regulatory region of curli biosynthesis is phylogenetically different among pellicle and non-pellicle forming strains. The disruption on modified cellulose and regulatory region of curli biosynthesis abolished pellicle formation in strains of E. coli. Besides, the addition of quorum sensing molecules (C4-HSL), synthesized by Aeromonas species, to pellicle formers abolished pellicle formation and implied a role of quorum sensing on pellicle formation. The deletion of autoinducer receptor sdiA in E. coli did not restore pellicle formation when cocultured with A. australiensis but modulated expression level of genes for curli and cellulose biosynthesis, resulting in a thinner layer of pellicle. Taken together, this study identified genetic determinants for pellicle formation and characterized the switching between pellicle to surface-associated biofilm in dual-species environment, facilitating better understanding of the mechanisms for pellicle formation in E. coli and related organisms.

Prevalence and clinical implications of abnormal body composition phenotypes in patients with COVID-19: a systematic review

Montserrat Montes-Ibarra, Camila E Orsso, Ana Teresa Limon-Miro, Maria Cristina Gonzalez, Emanuele Marzetti, Francesco Landi, Steven B Heymsfield, Rocco Barazonni, Carla M Prado

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The impact of body composition (BC) abnormalities on coronavirus disease 2019 (COVID-19) outcomes remains to be determined. We summarized the evidence on BC abnormalities and their relationship with adverse clinical outcomes in patients with COVID-19.

A systematic search was conducted up until September 26, 2022 for observational studies using BC techniques to quantify skeletal muscle mass, muscle radiodensity or echo intensity, adipose tissue (AT), and phase angle (PhA) in adults with COVID-19. We included 62 studies (69.4% low risk of bias) with 12 to 1,138 participants. Using computed tomography and different cut-offs, prevalence ranged from 22–90% for low muscle mass, 12–85% for low muscle radiodensity, 16–70% for high visceral AT. Using bioelectrical impedance analysis (BIA), prevalence of high fat mass was 51% and low PhA was 22–88%. Mortality was inversely related to PhA (3/4 studies) and positively related to intramuscular AT (4/5 studies), muscle echo intensity (2/2 studies), and BIA-estimated fat mass (2/2 studies). Intensive care unit admission was positively related to visceral AT (6/7 studies) and total AT (2/3 studies). Disease severity and hospitalization outcomes were positively related to intramuscular AT (2/2 studies). Inconsistent associations were found for the rest of BC measures and hospitalization outcomes

Abnormalities in BC were prevalent in patients with COVID-19. Although conflicting associations were observed among certain BC abnormalities and clinical outcomes, higher muscle echo intensity (reflective of myosteatosis) and lower PhA were more consistently associated with greater mortality risk. Likewise, high adiposity (IMAT, VAT and fat mass) was associated with adverse clinical outcomes.

Formulations, frames, and precedents: Unmaking history in public meetings

Karly Coleman

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Using an audio corpus documenting ten years of public discussions, I show how decisions about material urban infrastructures might be contested and reopened and how participants in these disputes frame their arguments. I focused on how past, municipal decisions about bike lanes were disputed in public meetings. My work demonstrates how micro-organizational, praxeological changes relate to a wider institutional history and how we might consider citizens' understanding of their ability to effect change in public meetings. This understanding may directly point to citizen perceptions of the urban material environment and relate their current actions to past decisions, even though they may not have been present when the initial decisions were made.

Optimizated Electrospinning Conditions for the production of a Chemical and Biological Protective Nanofibrous Membrane Made of Polyacrylonitrile Embedded with Magnesium Oxide

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Protection against chemical and biological compounds can be done through Personal Protective Equipment (PPE), such as protective clothing. Air-permeable membranes combined with a sorptive material and full encapsulation with impermeable materials and sealed clothing constructions are the main chemical and biological protective solutions currently used. Nanotechnology-enabled membranes with high surface-area-to-volume ratio and low pore size can combine enhanced the comfort and protection properties for the new generation of chemical and biological protective clothing. Electrospinning is recognized as one of the easiest and most inexpensive methods for the fabrication of nanofibrous membranes. Polyacrylonitrile is a polymer with interesting properties that can be used to electrospin nanofibers using dimethylformamide. Chemically and biologically active metal oxide nanoparticles can also enhance the functionality of the nanofibers. This research takes the advantage of magnesium oxide for detoxifying chemical and biological compounds. To achieve the optimization of nanofibrous membranes composed of polyacrylonitrile nanofibers embedded with magnesium oxide nanoparticles, the effect of a series of environmental and manufacturing parameters on the nanofiber morphology was studied. These parameters include the relative humidity, applied voltage, needle-collector distance, solution flow rate, and position and dimension of an auxiliary electrode. The next step of the work will consist in characterizing the performance in terms of protection against chemical and biological agents, comfort, and durability of the nanocomposite nanofibrous membrane. This work is part of the Canadian Department of National Defence (DND) IDEaS COMFORTS (Comfort-Optimized Materials For Operational Resilience, Thermal-transport, and Survivability) project.

Wear trial assessment of customized bras made using a newly developed bra fitting method

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Custom-made bras have the potential to solve and/or reduce the displeasure experienced by many women. This negative experience is intensified in women with atypical breast shape/size. These are women with significant breast asymmetry, voluminous breast and/or those who have undergone breast surgery. To obtain the best fit, the fitting process must be accurate, and consistent with the body type and breast shape. Human body has variation that exists from person-to-person. These variations have been shown to influence the fit of bras. Bras made on an individual basis in a process that takes the body and breast shape into account are more likely to provide the best fit, be more supportive, and comfortable, in particular for women with atypical breast shape/size. In this study, custom-made bras were manufactured for women with voluminous breast and breast asymmetry using a newly developed fitting procedure that involves fitting pre-assembled bra parts directly onto the body. Then, the bras are worn by participants for an average of five hours daily over one week. At the end of the wear period, the participants provide responses to a survey questionnaire on the fit, support, and comfort provided by the bra. The findings will inform the preparation of a standard operating procedure for bra fitting, help improve the design of the bespoke bras, and create awareness on the benefits of custom-made bras.

Unbecoming Human To become more Human - A Posthumanist Perspective on the Female Footbinding Phenomenon

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The re-interpretation of a historical phenomenon through the posthuman theoretical framework challenges the dualism of subject and object, allowing for a reconciliation of these boundaries. The re-opening of the discourse regarding this historical re-orientation and re-interpretation may allow for new possibilities in increased critical subjectivity and embracing objecthood. Through a posthumanist lens, this essay attempts to investigate the liminal zone between corporeality and materiality, which often manifests notions of stigmatization and misinterpretation due to classical humanist and anthropocentric ontology. One of these instances is the practice of Chinese female footbinding, where the co-existence of bound feet and lotus shoes adornment reflect shifting agential dynamics and functions as a posthuman prosthesis. This essay aims to challenge the dualism of subject and object in many humanist historiographies and research and explores the potential for a posthumanist viewpoint of re-interpreting epistemology and ontology. Posthumanism challenges us to re-examine our understanding of history and humanity by confronting reality beyond what we take for granted.

Parameters affecting the Measurement of the Efficiency of Joule Heating Textiles

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The lack of standardized testing protocols for Joule heating textiles restricts their commercial growth and narrows the range of available products despite the number of promising applications. Work was initiated to address this gap by developing measurement protocols of their efficiency, durability, and safety. For instance, inconsistent heating patterns can negatively impact the efficiency and comfort of a heating textile. This study examines the influence of various factors that can affect the measurement of heating textiles by testing six different types of structures: woven, knitted, inserted, stitched/embroidered, coated, and nonwoven. They were assessed using a thermocouple affixed to their surface to measure the temperature increase while they were powered for one hour. A polyester non-woven fabric was used as the top boundary condition to simulate a typical use configuration of heating textiles, for instance in a garment. Tests were also conducted in the air. The results indicate that the choice of adhesive tape used to fix the thermocouple to the textile surface do not affect the measured data. However, other conditions were observed to affect the results: the location of the thermocouple on the heating textile surface, the nature of the top boundary layer, the flow rate of the surrounding air, the presence of an oxide layer on the copper power leads, and variations in the environment temperature and relative humidity. These findings will improve the precision and reliability of measurements of the efficiency of heating textiles. Ultimately, this research will contribute to improving the quality of Joule heating textile products.

Use of Drinking Behavioural Biometrics in Combination with Orbital Infrared Thermography for the Early Detection of Bovine Respiratory Disease (BRD) in a Spontaneous Model

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Bovine respiratory disease (BRD) prevalence (70-80%) is the most important economic ($3 billion/year) and welfare (10-50% mortality) challenge of the beef cattle industry in North America. The objective of this study was to investigate the use of drinking behaviours in conjunction with orbital infrared thermography (IRT) as an automated, non-invasive method of BRD diagnosis in beef calves. Sixty-five weaned calves (N=65) were monitored over a 21-d period after 6 h transportation to predispose calves to BRD infection. Data collected from the automated IRT platform set at water station included orbital Max-temp, AVG-temp, # Drinking bouts (DB), Total drinking bouts/24h (TDB), AVG drinking duration/24h (ADD) and Fidget (# of IRT frames/24 h). The IRT platform was compared to a clinical score index based on respiratory insult signs (visual observation) and haematology analysis. Thirty-five combinations between drinking behaviours and IRT were tested to identify BRD true positive calves. Max-temp accuracy resulted in Sensitive (Se): 88%; Specificity (Sp):88%; Youden index (J): 0.77 and AVG-temp Se: 100%; Sp: 88%; J: 0.88. However, greater accuracy was achieved when combining Max-temp, AVG-temp, DB, ADD, and Fidget (Se: 100%; Sp: 100%; J: 1.0). Similar evaluations were performed 24 and 48 h prior (subclinical-phase) to the onset (d 0) of BRD infection using the same combination resulting in Se: 94.11%, Sp: 51.51%, and J: 0.45 24 h prior d 0 and Se: 82.35%, Sp: 62.28%, and J: 0.44 48 h prior d 0. Thus, a Non-invasive automated IRT platform diagnosed BRD comparable to the clinical score index.

Understanding how laying hen strain impacts perching biomechanics and keel bone damage in enriched-housed laying hens

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Laying hen housing in Canada is shifting towards enriched housing but despite the welfare benefits, there remain welfare concerns including a higher prevalence of keel bone damage (KBD). KBD can lead to negative affective states, pain and decreased egg production. The objectives of this study were to assess how perching biomechanics differ by strain, age, and perch shape and how this may impact KBD in enriched housing. Four commercial strains (Lohmann White, Lohmann Brown, ISA Brown, and Shaver White) and two heritage strains (Antique Shaver Rhode Island Red and Antique University of Saskatchewan White Leghorn) were studied (n=120). On both round and mushroom-shaped perches, laying hens were evaluated using perching kinematics at 18, 29, and 70 weeks. Kinematics and dual x-ray absorptiometry assessed perching biomechanics and bone health, respectively. Indicators for instability while perching included movement speed and forward and backward motion. Shaver White moved faster than Rhode Island Red ($P<0.001$), while heritage strains moved more than commercial strains ($P<0.001$). At 18 and 29 weeks on round perches there were fewer ($P<0.001$) and faster movements ($P<0.008$) than at 70 weeks on mushroom perches. Rhode Island Red had denser ($P<0.001$) and longer keels ($P<0.001$) than Lohmann and Shaver White. There was no correlation between perching biomechanics at 70 weeks and KBD. Strain, age and perch shape had a significant impact on perching biomechanics. Strain and perch shape in enriched housing can be manipulated to reduce perching instability.

Cecal microbiota of broilers and layers raised in the same environmental

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Broilers and layers present distinguish physiology resultant from successful breeding programs that selected birds for either meat or egg production. To date, it is not clear if the differences in genetic background had resulted in distinguish gut microbiota composition between broilers and layers. Comparisons between the microbiota of broilers and layers is confounded by differences in the rearing environment, age, and feed composition. This study used 16S rRNA sequencing to analyze the cecal microbiota of broilers and layers reared in the same environment and fed the same diet. We found no differences in alpha-diversity, beta-diversity or in the abundance of bacterial taxa, indicating that the cecal microbiota of chickens reared in the same environment and fed the same diets is the same. On the other hand, we found that age had a major effect in the cecal microbiota composition ($p = 0.001$, $r2 = 0.40$). Comparisons between the microbiota of 35-day old chickens to that of 7-day old chickens indicated that older birds presented higher microbial richness ($p < 0.001$), evenness ($p < 0.001$), and phylogenetic diversity ($p < 0.001$). A total of 97 taxa were found to be differentially abundant between birds of different ages. Older birds had higher abundance of Bacteroidetes, Verrucomicrobia, Deferibacteres, and Selenomodales; whereas most of the taxa enriched in younger birds were members of Firmicutes. We concluded that microbiota composition is highly affected by age, but not by the genetic background of chickens raised in the same environment and fed the same diets.

Response of different broiler breeders' BW trajectories on the offspring performance

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The evolution in commercial broiler production over the 50 years is remarkable in many aspects. Growth rates rose at least 400%, while feed conversion rates dropped 50%. This has been possible due to advances in nutrition and management, mainly due to the constant genetic selection for growth efficiency. On the other hand, the gap between broiler and broiler breeders' body weight (BW) over the years is evident. Due to the high severity of feed restriction to maintain the BW target in broiler breeders, one of the major concerns of the poultry industry is that broiler breeders are becoming leaner, with a lack of fat reserves, limited nutrients and reduced energy reserves, which could result in the lesser ability of these birds to overcome usual stresses and challenges under commercial conditions and could negatively affect the birds' welfare and offspring performance. Recent literature has suggested that increases in broiler breeder's BW do not negatively affect the reproductive performance, and female and male offspring from breeders fed 10% higher than the target BW had lower FCR and heavier gut weight, respectively. Further studies are necessary to understand whether the broiler's performance is affected by different BW curves. Our research aims to investigate how the broiler's performance (body weight, feed conversion ratio, breast yield and abdominal fat pad) is affected by different maternal BW curves and different feeding systems: Conventional and Precision Feed System.

Silicon ameliorates clubroot responses and modulates the phytohormones in canola (Brassica napus L)

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Clubroot, caused by Plasmodiophora brassicae is a devastating soil-borne disease that leads to severe yield losses in canola crops. Clubroot management faces challenges due to pathotype shifts, and an integrated disease management strategy is essential for its control. Silicon (Si), an abundantly available element is known to mitigate several stress factors, in turn enhancing plant growth and resistance against phytopathogens. However, there are no reports of Si in ameliorating clubroot symptoms in canola. Through our study, we found that Si application at moderate (0.5 g & 0.75 g) and high concentration (1.0 g) reduced clubroot symptoms and improved plant growth parameters under greenhouse conditions. We further investigated the P. brassicae-induced gene expression and endogenous phytohormone profiles altered due to Si application (Si0.5 and Si1.0) using an 'omics' approach. Our findings led to the identification of several differentially expressed transcripts related to phytohormone signalling such as salicylic acid (SA-) and jasmonic acid (JA-) mediated signal transduction (e.g. PDF1.2, NPR1) as well as auxin (IAA) and cytokinin (CK) biosynthesis and metabolism (e.g. TAA, IPT). We also noted clear differences in endogenous phytohormone levels (such as CK, IAA, SA, JA and ABA) in the clubroot infected tissues in presence of Si. This is the first report that Si ameliorates clubroot symptoms and modulation of phytohormone-mediating defense signalling by their altered endogenous levels could be a probable mode of action among the other metabolic processes.

Effects of semi-natural vegetation on the assemblage and functional diversity of arthropods in canola fields

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Canola production in the Canadian prairies is affected by a variety of introduced and native herbivorous insect pests. Mortality by natural enemies (predators and parasitoids) is a major factor determining the population dynamics of insect pests. Grassy and herbaceous semi-natural vegetation in field edges may increase natural enemy richness and abundance through the provision of alternative prey and overwintering sites. This study was conducted to determine the effects of distance to semi-natural vegetation on arthropod assemblage and functional diversity. Pitfall traps and yellow sticky cards were used to collect arthropods along two sampling transects: one along a field edge adjacent to semi-natural vegetation (1 m into the field), and another in parallel (100 m into the field). Collected arthropods were identified to family, and joint species distribution modelling was used to analyze the taxonomic and functional composition of arthropod assemblages, as well as associations of individual families to environmental factors and sampling techniques. Preliminary results from this study indicate a higher arthropod richness near semi-natural vegetation compared to the interior of the field. This might have meaningful implications for conserving semi-natural vegetation and developing integrated pest management strategies in canola agroecosystems.

Identifying superior photosynthetic efficiency traits in canola Brassica napus gene pool

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Canola is the second major source of high-quality vegetable oil in the world. Most canola improvements to date that have come from breeding and manipulation of both plant morphology and management are at saturation. This study focuses on the assessment of photosynthetic efficiency as a strategy to improve crop performance. In the present study, 170 accessions from a Brassica napus gene pool (two checks included) were grown at West-240, University of Alberta south campus in 2021. The experiment was designed with an incomplete randomized block design aiming to identify canola accessions with superior photosynthetic traits. Accessions analyzed for photosynthesis-related parameters include: maximum quantum efficiency (Fv/Fm), quantum yield of photosystem II (ΦII), non-photochemical quenching (ΦNPQ), non-regulatory non-photochemical energy dissipation (ΦNO), and net photosynthetic rate at saturated light (Amax), as well as physiology-related parameters such as stomatal conductance (gs), water use efficiency (WUE), leaf-minus-air temperature (dT), and seed yield. Using a principal component analysis, gs, ΦII, and dT were the main drivers to get a high seed yield. Moreover, using cluster analysis, accessions 1CA2354.097-A2070, 1RA1638.084, 5CA1678.393-A2099, 1CA1609.060-A2069, and Quantun were those accessions with the highest photosynthetic efficiency. This study will provide both canola breeders and crop producers with new photosynthetic and physiological information and accessions with that harvest sunlight better resulting in increased yield.

Effect of feedstock type and pyrolysis temperature on seeding characteristics of biochar for struvite crystallization

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Struvite crystallization is a viable approach for recovering phosphorus from phosphorus-rich solutions such as urine; however, the seeding characteristics of biochars on struvite crystallization and the impacts of feedstock type and production temperature are poorly understood. This study investigated the application of microwave-pyrolyzed biochars produced from different feedstocks and under different temperatures as seeding materials for struvite crystallization from urine and the influence of biochar properties on the overall nutrient recovery and struvite crystal size. Biochar pH had no effect on struvite crystallization due to the buffering effect of urine. Sawdust biochar produced at 500 C had the highest struvite yield (7.91 g L-1), phosphorus (97.9%), and ammonium recovery (87.1%) and relative crystal size (85.2%) compared to the non-seeded treatment due to the higher surface area, pore volume, and hydrophobicity. Increasing pyrolysis temperature increased biochar's hydrophobicity and bulk density, improving the seeding process. Regardless of the feedstock type, higher biochar zeta potential and electrophoretic mobility enhanced struvite recovery as struvite. The ash content of biochar was negatively correlated with its surface area, pore volume, and particle size, but positively correlated with the bulk density and suspension stability of biochar. In conclusion, feedstock type and pyrolysis temperature significantly affected biochar properties, and therefore, interactively influenced struvite crystallization and should be carefully selected to improve the efficiency of biochars for phosphorus recovery from phosphorus-containing solutions such as urine and wastewater.

Americium-241 in peat bogs as a global marker of the beginning of the Anthropocene: examples from Europe and North America

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Fallout radionuclides are being considered as global markers of the start of the Anthropocene, but there are questions regarding the extent to which they are preserved in bogs. The purpose of this study is to determine the fidelity of 241Am records in peat cores from these peatlands. Here, we compare the position of the 241Am activity peak with the depth dating from 1963 as determined using the 210Pb CRS model. In total, 35 peat cores from 30 locations in Europe and North America were used, collected by our team from the past 30 years for studying atmospheric deposition of trace metals. Out of the 35 cores, 29 show a single peak of 241Am, 5 gave two peaks with similar 241Am activity and 1 core showed three peaks. Of the 29 cores with a single peak, 23 are within 10 years of AD 1963, based on 210Pb dating; of these, 12 are within 5 years from AD 1963. For 11 of these cores, one of which contained two peaks in 241Am, 14C age dates obtained using 14Cbomb-pulse were also available for comparison. The utility of 241Am as a marker of the start of the Anthropocene, assuming it is defined as AD 1963, depends on the acceptable degree of uncertainty. Given that 241Am was detected using gamma spectrometry in 35 of the peat cores collected from 16 locations in Europe and 14 locations in North America, the hemispheric distribution of this radionuclide appears to have already identified the start of the Anthropocene.

Impact of dust dissolution on the dissolved fraction (<0.45 µm) of trace elements (TEs) and their size-based distribution in peatland waters in the Athabasca Bituminous Sands (ABS) region

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Considerable volumes of dust are generated due to bitumen mining activities in northern Alberta. The reactive mineral phases of these dust particles can potentially dissolve in the acidic waters (pH<4) of bogs. Their dissolution could release TEs, which could be beneficial or detrimental for the respective ecosystem if present in bioavailable forms. The impact of dust dissolution on TEs in the dissolved fraction (<0.45 µm) of peatland waters (both surface and moss porewaters), within the ABS region, was evaluated. Mobile lithophile elements (Mn, Li) and bitumen-enriched elements (V, Ni) were present mainly in the “truly dissolved” fraction (<1 kDa) of peatland waters. Moreover, a considerable fraction (>30%) of some TEs (Al, Y, Th, Pb, Ba, Sr) was associated with small (6-35 kDa) and large (>600 kDa) primarily inorganic colloids in moss porewaters. In contrast, DOM-associated (Al, Y, Th, Pb) and mainly ionic (Ba, Sr) species of these elements were present in surface waters. A clear transition of inorganic to DOM-associated/ionic species indicates an increase in dust dissolution with long-time equilibrium in surface waters compared to moss porewaters. These findings suggest that the dissolution of atmospheric dust generated from open-pit mining could increase the proportion of the “truly dissolved” fraction of some lithophile elements in peatland waters. In contrast, the concentrations of potentially toxic TEs (Pb, Cd, Tl, Sb) were underrepresented and, except for As, did not increase toward industry. This also suggests that peatland waters could be used for monitoring the impact of industrial activities on the atmospheric environment.

Impact of filtration on the concentrations and size distribution of dissolved trace elements in surface waters

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Filtration through a syringe filter with a 0.45 μm pore size is often applied to obtain the dissolved fraction of natural waters. This fraction of trace elements (TEs) is of special concern because it is associated with greater mobility, bioaccessibility, and potential bioavailability. The impact of filtration on concentrations of primarily ionic and colloidal TEs was investigated by measuring the concentrations and forms of TEs in increasing volumes of water from 0.5 to 16 mL, passed through a single 0.45 μm filter. The filtered composite sample was then re-filtered to assess the adsorption of TEs onto filters. Large amounts of Al, As, Co, Fe, Mn, Pb, Th, and V were excluded from the dissolved fraction as increasing volumes of a boreal river sample were filtered. On the other hand, Cu, Cd, Mo, and Ni were excluded as the filtered volume of bog surface waters increased. Large inorganic colloids > ca. 20 nm in hydrodynamic diameter and primarily ionic species were most affected by filter clogging. Only U was greatly influenced by adsorption to filters in the boreal river samples. However, both boreal river samples and bog surface waters were contaminated by Zn during filtration. Fewer artefacts were observed for bog surface waters than for boreal river waters, possibly because there were fewer large particles in the bog waters.

Investigation of biodegradation of hydrocarbons under different redox conditions in oil sands tailings to mitigate methane emissions

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**** Abstract redacted ****

Chronic toxicity and bioaccumulation of trace elements in daphnids exposed to water and sediment from an oil-sands tailings pit lake

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Lake Miwasin is a constructed pilot-scale oil sands pit lake containing treated tailings, generated by the extraction of oil from Alberta's bituminous sands. It is expected that such lakes will help to ameliorate any toxic effects of tailings as a part of their return to the surrounding landscape. The objective of the early studies was to determine toxicity of Lake Miwasin water and sediment to the model freshwater invertebrate species Daphnia magna in year 1 and 2 following lake construction, and to analyze trace metal body burdens for trace elements that may contribute to the observed effects. Acute 48 h toxicity tests were conducted with mortality as the endpoint, and chronic 21 d toxicity tests were performed using reproduction and growth as endpoints. No mortality was observed over 48 h; however, final body masses were significantly larger in daphnids exposed to Lake Miwasin water. Daphnid reproduction was also affected, with reduced total neonate production observed in both Lake Miwasin water and water/sediment groups relative to controls. Exposure to Lake Miwasin water and water/sediment increased trace metal burdens in daphnids. To mimic the effects of riparian runoff into the lake as this constructed ecosystem evolves, additions of commercially available sources of dissolved organic matter (DOM) were made to exposure waters. The inclusion of DOM did not ameliorate the effect of Lake Miwasin water on reproduction in chronic exposures. Developing a better understanding of the evolving toxicity associated with trace elements in Lake Miwasin is important for assessing the safety of future pit lakes and water releases.

Poster presentations

Abstracts are presented in order of poster viewing.

Novel use of bacillus fermentation and sourdough to improve bread volume and storage life

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Bread is a staple food worldwide. Sourdough has reappeared as a natural improver. Sourdough increases storage life and improves bread volume. Bacillus spp. produce a wide array of hydrolytic enzymes, which might be beneficial in bread-making. Bacillus amyloliquefaciens and Bacillus velezensis also produce antifungal lipopeptides. However, bacilli also spoil bread. We hypothesised that bacilli fermentation is beneficial if their spoilage activity is controlled using sourdough. We therefore evaluated the use of a Bacillus ferment in conjunction with sourdough in white wheat flour and wheat bran. Lm. reuteri sourdough and B. amyloliquefaciens or B. velezensis ferments were produced separately either with white flour or bran. For white wheat bread, 0 to 20% of flour was fermented with bacilli and mixed with 20% sourdough. For bran bread, 0 to 20% of the bran was fermented with bacilli; remaining bran was fermented with Lm. reuteri up to 20%. Breads water-soluble polysaccharides were characterized, and bread was assessed with respect to specific volume, mould-free shelf life, and compared with straight dough bread. Bacilli solubilized arabinoxylans during bread fermentation. The specific volume of bread was the highest with 2.5% Bacillus ferment inclusion, resulting in 3.98 and 3.64mL/g in white flour and bran respectively. Increasing the concentration of Bacillus ferment decreased volume and, caused ropy spoilage at 10 and 20%. The mould-free shelf life was the longest in bread with 20% Lm. reuteri sourdough without Bacillus ferment. After challenge with Penicillium roqueforti spoiled was observed at 193±5 and 182±4 hrs in white and bran bread respectively.

A randomized controlled trial to assess the efficacy of fish oil supplementation to improve impaired non-fasting lipid metabolism in youth with obesity

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Background:
Childhood obesity is a significant and independent risk factor for future cardiovascular diseases (CVD). Guidelines recommend assessing fasting total cholesterol and low-density lipoprotein cholesterol (LDL-C) for dyslipidemia diagnosis in youth. However, fasting lipid markers are often normal in overweight/obese youth due to altered hormonal status. Thus, many youths with impaired lipid handling can remain undetected yet have increased CVD risk. Our group has demonstrated that compared to healthy controls, youth with obesity have higher non-fasting remnant cholesterol (RC), despite normal levels of LDL-C. Studies in adults have shown that high concentrations of TG and RC can be reduced by supplemental and/or high dietary intake of n-3 fatty acids.
The impact of increased dietary intake of n-3 fatty acids on remnant cholesterol in obese youth is unclear.
Objective:
In this study we aim to determine the efficacy of fish oil supplementation on fasting and non-fasting plasma TG and RC in youth with obesity.
Methods and materials:
In this randomized double-blinded controlled trial, we will recruit 70 youth aged 14-17 and allocate them either to the intervention group (n=35, 3g/d fish oil capsule) or control (n=35, 3g/d olive capsule) for 8 weeks. The inclusion criteria are youth aged 14-17 with body mass index (BMI)>97%percentile. Exclusion criteria includes endocrine disorders/diseases. At the first and last day of intervention, we will assess dietary intake, anthropometric measurements and fasting and non-fasting level of TG and RC.
Anticipated results:
Our hypothesis is that following 8 weeks of intervention, youth in the fish oil intervention group will have significantly lower non-fasting TG and RC in comparison to those youth in the control group.

Effect of modulation of auxin response on clubroot disease development in Arabidopsis roots

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Clubroot disease is a serious soil-borne disease caused by the pathogen Plasmodiophora brassicae in roots of cruciferous plants including the model species Arabidopsis thaliana. The plant hormone auxin plays a key role in gall initiation and expansion causing irregular swelling and abnormal growth of the roots. To determine the role of auxin receptors in the development of clubroot symptoms, Arabidopsis auxin receptor double (tir1-10, afb2-3) and quadruple (tir1-10, afb2-3, afb4-8, afb5-5) mutants were compared with a wild-type (WT; Col-0) line in a peat-based growth system. First, we examined the response of the mutants and WT to 2,4-D using seedling root growth inhibition assay. Relative to the WT, both the double and quadruple mutants had significantly lower inhibition of primary root growth to 2,4-D, showing the overall auxin response was reduced in the mutants. For performing clubroot assays, seedlings (14-d-old) were inoculated with 1x105 spores/mL of P. brassicae and at 32 days after inoculation (DAI) the disease severity was assessed for calculating the Index of Disease (ID), and the fresh weight of the root 1.5 cm from the root-shoot transition was recorded. The wild-type was the most susceptible to the clubroot disease (ID: 91.7%) followed by the double mutant (ID: 63.3%) and the least affected was the quadruple mutant (ID: 51.2 %), The fresh weight of the root followed similar trends as observed for ID. Overall, the results suggest that reduction of auxin signaling in the genetic model species Arabidopsis decreases clubroot disease development.

Effect of drought stress on growth, symbiotic nitrogen fixation, soil nitrogen availability, and soil health parameters in forage legumes.

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Forage legumes provide protein-rich feed to livestock and improve soil health through symbiotic nitrogen fixation (SNF) by converting atmospheric nitrogen into usable forms. Recently, drought has been a significant concern as it limits plant growth, yield, and SNF in legumes. We hypothesize that drought stress can negatively impact SNF in forage legumes, thus influencing soil health parameters as well. In this study, we evaluated the effects of drought stress on nodulation, plant growth, physiological parameters, SNF, soil nitrogen availability, and soil extracellular enzyme activities of alfalfa (Medicago sativa) and red clover (Trifolium pratense) under controlled environmental conditions. The drought treatments were imposed at the flowering stage, where the soil moisture contents were maintained at 20% field capacity (FC) (severe drought), 40%FC (moderate drought), and 80%FC (well-watered) for three weeks. Severe drought had significant negative effects on nodulation, photosynthesis, plant biomass, SNF, and shoot N-fixed. Leaf chlorophyll content increased under both drought treatments in red clover and only in moderate drought in alfalfa. The extracellular enzyme assay showed that drought stress reduced the N-acetyl-glucosaminidase in alfalfa and β-D cellobiosidase activity in red clover. Microbiome data shows a shift in Actinobacteria abundance in the rhizosphere under severe drought in both legumes; however more evident in alfalfa. Finally, the total available soil nitrogen increased following severe drought conditions in both forage legumes. These results indicate that drought has deleterious effects on nodulation, plant growth, and carbon and nitrogen cycling enzyme while positively impacting nitrogen rhizodeposition into the soil.

The performance and stability of spring wheat cultivars mixtures in contrasting management conditions in western Canada

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Wheat is an important crop across the Canadian Prairies. The use of varietal mixtures (VMs) has been proposed to combat climate and pest challenges. The aim is to determine whether Canadian Western Red Spring (CWRS) or Canadian Prairie Spring Red (CPSR) wheat mixtures increase yield or yield stability, and reduce the incidence of Fusarium head blight or leaf spot complex in both conventional and organic systems. Previous research indicates that VM utilization may increase both wheat yield stability and reduce pest incidence. Some studies have produced mixed results and further research is warranted. This trial was conducted at six sites in Alberta and Saskatchewan from 2021-2022. The trial involved 5 cultivars from each class that were grown in pure stands and in two- and three- way mixtures for 25 combinations. Yield, yield stability, protein, and disease incidence were all analyzed. In CWRS wheat, twelve mixtures had a specific mixing ability (SMA) >0, and the mixtures of Titanium:Lillian, Glenn:Carberry, and Glenn:Titanium:Lillian had SMAs of 35.0-56.8. In CPRS wheat, ten of the mixtures had SMA >0 and Forefront:Penhold, Forefront:Foray, and Foray:Crossfield had the highest SMAs of 4.7-8.6. Additive main effects and multiplicative interactions (AMMI) analyses revealed significant ($P<0.01$) results among cultivars, environments, and interactions. Several mixtures in each class were highly stable. By determining the effectiveness of VMs in both CWRS and CPRS wheat classes, new management strategies can be developed to tackle the predicted climate change challenges. These results indicate that certain VMs can out-yield purestands or may be more stable.

Effects of humic-based soil amendment on alleviating drought stress in canola (Brassica napus L.)

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Canola (Brassica napus L.) is one of the dominant revenue-generating crops in Western Canada, comprising over 98% of total production across Canada. Despite its significant economic importance, limited water availability often restricts the productivity of western Canada's canola cropping systems. Drought stress can result in over 30% yield loss in canola due to its susceptibility to drought stress. Furthermore, climate change is predicted to aggravate the drought issues in terms of frequency and severity across Canadian Prairies. Humic-based products are known to improve drought tolerance in various crops. Humalite is a natural humate material deposited in southern Alberta and rich in humic acids (HA). To assess the beneficial effects of humalite on canola growth and in alleviating drought stress as a soil amendment, a greenhouse study was conducted with canola grown under 400, 800, and 1600 kg ha-1 of granular humalite. Drought stress was imposed after two weeks of plant growth, where the pots were maintained at the moisture level of 30% field capacity (drought) and 80% field capacity (well-watered) until full maturity. Data were collected at the flowering stage representing leaf photosynthetic assimilation (A), transpiration (E), stomatal conductance (gs), and photosynthetic water use efficiency (WUE). At seed maturity, data were collected on seed yield and yield quality components, including oil content, fiber content, free fatty acids (FFA), trans-fatty acids, and iodine value (IV). The present research may enhance the understanding of humic-based supplement materials on plant growth and validate the humalite product on improving crop performance under moisture deficit stress.

Lipids as Feedstock for Sustainable Aviation Fuel Production

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The aviation sector is responsible for transporting billions of passengers and tons of goods annually. Even though it was impacted in the last couple of years, it is expected to return to pre-pandemic levels in 2023 and double its demands over the next 20 years. However, this industry remains almost entirely dependent on fossil fuels; hence it is exploring the possibilities of using sustainable aviation fuels, and developing a new aviation fuel production pathway is necessary. The Bressler Lab has developed a two-step thermal lipid conversion process to convert oils and fats to produce renewable diesel and gasoline at a low cost. Previous work has shown that operating this process under light hydrocarbon gases results in branched hydrocarbon compounds, which are essential for aviation fuels. This research seeks to further explore and optimize the use of light hydrocarbons with four carbons to enhance the yield of branched compounds and understand their mechanisms. Initial experiments have shown that four-carbon isomers have different behaviors during the pyrolysis reaction with the model fatty acid, with a specific molecular structure that showed promising results, almost doubling the yield of branched compounds when compared to an inert atmosphere. Furthermore, a molecular mechanism was proposed, showing that different carbon-chain fatty acids yield 2-methylakyl compounds with determined carbon length chains. These results expand the knowledge in high-temperature chemistry and present a new pathway to convert any lipid-based feedstock, from restaurant greases to agricultural wastes to aviation fuel, and concomitantly reduce the aviation sector's carbon footprint.

Comparative genomic analysis of *Periweissella* and the characterization of novel motile species

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**** Abstract redacted ****

Non-native Cicer milkvetch effects on soil microbiome and ecosystem goods and services on Canadian dry mixedgrass prairie

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Cicer milkvetch (Astragalus cicer L.) is an introduced perennial forage legume to the Canadian prairies. While cicer milkvetch can increase forage production, it has previously been found to decrease soil carbon. Reductions in soil carbon may be associated with changes in the soil microbial population, which can affect soil carbon and nutrient cycling. Therefore, this research aims to understand how cicer milkvetch may impact the soil microbiome and the ecosystem goods and services provided by grasslands. A field study was conducted in the dry mixedgrass prairie region at Mattheis Research Ranch, where ten plots of cicer milkvetch were randomly selected, each with an adjacent plot of untreated grassland and grassland with nitrogen fertilizer (50 kg N ha -1) applied to simulate legume nitrogen fixation effects. Preliminary results show that total shoot biomass and available soil nitrogen were higher under the cicer milkvetch compared to grass plots without nitrogen fertilizer. However, available soil nitrogen was not significantly different between cicer milkvetch and grass supplied with nitrogen fertilizer, suggesting cicer milkvetch plays an important role in altering soil nitrogen. Soil microbiome data shows that alpha diversity was not significant between cicer milkvetch and grass plots, but cicer milkvetch had a tendency towards higher diversity. Furthermore, cicer milkvetch had a significantly higher abundance in Rhizobiaceae, Pedomicrobium, and lower Patulibacteraceae compared to the grass plots. Future work involves enzyme activity and CN elemental analysis of vegetation and soils to understand the mechanisms by which cicer milkvetch reduces soil carbon.

Effects of maternal growth strategies on hatching parameters and broiler performance

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Maternal growth pattern, level of feed restriction and age can all have an impact on broiler growth performance. This study comprised of two experiments. The first experiment investigated the effects of early maximum pubertal growth (MPG) and early gain (EG) in body weight (BW) of broiler breeders on broiler growth performance and carcass traits. It was hypothesized that the earlier the MPG and higher the EG, the better the broiler efficiency. In a controlled trial, precision-fed 30 female Ross 308 broiler breeders were randomly assigned to 12 unique growth patterns. These included 6 levels of MPG phase and 2 levels of EG for each level of MPG. With precision-fed broilers from these broiler breeders at ages 32, 42, and 52 weeks, three 42-day progeny trials were carried out. The second experiment evaluated broiler growth performance in response to two levels of maternal feed restriction. It was hypothesized that broiler efficiency increases as maternal BW and fatness increases. Precision-fed 60 female Ross 308 broiler breeders were either fed ad-libitum or restricted at breeders recommended BW. This experiment comprised of three 42-day progeny trials with precision-fed broilers from the ad-libitum and restricted broiler breeders at 32, 42, and 52 weeks of age. In both experiments, analyses were performed to evaluate the egg weight, embryonic mortality, broiler BW, feed conversion ratio and carcass traits with maternal MPG as a continuous effect and EG, maternal age and offspring sex as discrete effects. Males were heavier than females from day 21 to 42.

Reducing Chemotherapy Induced Inflammation in Colorectal Cancer: The Benefits of Long-Term Dietary fish Oil in a Preclinical Model

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Introduction: Omega-3 fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), have lipid-lowering and anti-inflammatory properties. Both short and long-term fish oil (FO) treatment mitigates chemotherapy-induced myosteatosis. However, the differential effects of both short- and long-term treatment in regulating inflammatory response in this model remain unexplored. To gain insight into the underlying mechanisms, we carried out transcriptomics analysis of gastrocnemius muscle. Methods: Female Fischer 344 rats were fed either a control diet for the entire study (control) or switched to a diet containing FO (2.0 g /100 g of diet) one week prior to tumor implantation (Long term; LT-FO) or at the start of chemotherapy (Short term; ST-FO). Chemotherapy (irinotecan + 5-fluorouracil; FOLFIRI) was initiated two weeks after tumor implantation (1-cycle) and one week thereafter (2-cycles). RNA was extracted from gastrocnemius muscle and subjected to transcriptomic analysis. Results: A total of 601 DEGs were identified between the ST-FO vs. Control (1 cycle), while 129 upstream regulators were enriched. In the LT-FO vs. Control (1 cycle), 804 genes were Differentially expressed. Collectively, upstream regulators related to lipid metabolism (PPARG, CEBPB) and inflammation (TNF-a, NFKB, STAT3) were inhibited in both ST-FO and LT-FO vs. Control (1-cycle). However, upstream regulators relating to inflammation were activated only in in the ST-FO vs. Control (2-cycle) and not LT-FO at 2-cycles. Conclusions: LT-FO appears to be more efficacious than ST-FO in preventing inflammatory response after 2-cycles, which provides insight on the appropriate timing in the administration of FO to mitigate these deleterious effects in cancer patients receiving chemotherapy.

Nested Association Mapping to Identify Stripe Rust Resistance QTLs and their markers in Spring Wheat

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Stripe rust, caused by Puccinia striiformis f. sp. tritici, is an airborne disease. It is emerging as the most damaging wheat disease in western Canada. The pathogen overwinters in the Pacific Northwest of the United States and travels to Canada through the Puccinia pathway, where the local weather favors disease development. Once infected, the fungus reduces the photosynthetic leaf area by accumulating yellow- to orange-colored spores as stripes on leaves. The evolution of the new stripe rust race PstS1 leads to a 10–90% yield loss due to its ability to cause infection at warmer temperatures. Consequently, some traditionally resistant wheat cultivars have now become susceptible to new races of pathogens. One of the most effective ways to combat this pathogen is to develop stripe-rust-resistant wheat cultivars. Thus, there is a need to identify new resistant genes for wheat breeding programs. In this study, the new stripe rust-resistant lines were selected and used to develop recombinant inbred line (RIL) populations to segregate significant genes contributing to resistance against the stripe rust pathogen. These RIL populations represent three nested association mapping (NAM) populations. Future studies will encompass replicated trials of NAM populations to carry out the phenotypic analysis. After that, populations will be grown in greenhouses for genotypic analysis using the SNP bead chip to precisely map new stripe-rust-resistant genes and quantitative trait loci (QTLs) using consensus linkage maps. These QTLs will be further analyzed to develop molecular markers and introduce them into widely grown wheat cultivars.

Looking for visible signs of changes in polyimide films after hydrothermal aging.

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When combating fires, firefighters must deal with a variety of hazards. Firefighters are protected from these hazards by their fire protective clothing (FPC). FPC are produced using inherently flame-resistant materials. These fibers may lose their performance over the service life due to exposure to various hazardous conditions like extreme heat, moisture, UV radiation. Exposure of FPC to moisture may be due to rain, water from fire extinguishers, snow, laundry, and perspiration among others. If there is a tear or a stain on a material, it is visible to the naked eye. But determining the end-of-life of FPC is difficult as the changes produced on the material are not always visible and end-of-life sensors are critically needed. In this study, polyimide films are explored for use in a moisture-sensitive end-of-life sensor to mimic the aging due to the exposure to moisture of the high-performance fabrics used in the outer shell of FPCs. Polyimide film specimens are hydrothermally aged at different temperatures (70, 80, and 90□C) for different time intervals up to 56 days. Then the aged films are analyzed for any visible changes. The specimens became brittle with aging, and the color darkened. The change in color was quantified using a spectrophotometer. This color change was related to changes in the side groups of the polyimide molecule. The next step of this study is to find if there are any surface features like cracks formed on the surface of the aged films.

Optimized UV-protection for the antimicrobial finish on protective clothing

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Biological protective clothing is generally used to protect the wearer from bacteria and viruses. However, contaminated protective equipment can act as a vector for the microorganisms and lead to widespread transmission among people. In this perspective, having a self-decontaminating fabric that can be used for protective clothing and PPE and deactivate the pathogens upon contact would be an ideal solution to limit cross-contamination. Such self-decontaminating fabric can be obtained by applying a biocide finish on the base fabric. N-halamine is a fast-acting biocide that can be regenerated by halogenation using a simple source of free halogens. The effectiveness of N-halamines has been demonstrated with a broad range of microorganisms such as viruses, bacteria, fungi, and yeasts. However, the active compound of N-halamine is sensitive to light, which generally limits the application of N-halamines to innerwear. In this research, an N-halamine-based fabric finish incorporating metal oxide nanoparticles has been investigated to increase the resistance of the self-decontaminating finish to UV light. The finish formulation was optimized in terms of the type, size, and concentration of the nanoparticles, considering the residual halogen content after UV exposure and the impact of the finish on the fabric colour. The bactericidal activity of the optimized finish formulation was assessed as well as its impact on the fabric's performance and durability to simulated use conditions.

Stopping smoke before it reaches the skin: Production of aramid nanowebs to protect against smoke-produced carcinogens in firefighter protective clothing

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**** Abstract redacted ****

Studying the potential for density management to moderate drought effects in coastal plantation forests of British Columbia

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**** Abstract redacted ****

Using archived soil samples to examine carbon sequestration after 20 years of conservation tillage in Alberta, Canada

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Sustainable agriculture, a climate change solution, improves soil and environmental health. Moreover, healthy soil supports life and has the fundamental ability to sequester carbon from the atmosphere and stores it below ground long-term. In extreme circumstances, degraded soil health results in desertification and the inability to support life. Maintaining soil's health is, therefore, essential for food security and climate change mitigation. The soil quality monitoring project collected and archived soil samples across Alberta's agroecosystems from 1998 to 2007. In 2019, we resampled these sites with the aim to analyze carbon stability and determine if conservation tillage has promoted long-term carbon sequestration. The methodological approach of the research is to use Fourier-transform infrared spectroscopy (FTIR) to analyze carbon bonds in soil organic matter (SOM). For this, I will perform FTIR measurement in both bulk soil and in soil oxidized with sodium hypochlorite in order to create a subtraction spectra. The idea is that the oxidation will remove the SOM, thus the subtraction spectra will allow me to analyze only SOM fraction. This study will evaluate whether 20 years of sustainable agriculture can enhance soil carbon sequestration and storage and provide Alberta farmers with a long-term assessment of transitioning to regenerative agriculture.

Exploring the Agronomic and Soil Health Benefits of Liming in the Canadian Prairies

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Crop production is limited by acidic soils in many parts of the world. In Canada, occurrence of acidic soils has been reported since the 1960s in Alberta and northeastern British Columbia with about a third of the soils having a pH of 6 or lower. About 6.3 million acres of land in Western Canada is considered acidic (pH 6.0 or less) and another 8.5 million acres have a pH of 6.1–6.5. With the long-term and increasing rates of application of N fertilizers, soils might become increasingly acidic across Western Canada. Lime is not commonly used in the Canadian prairies because of its high costs. Information on the best liming sources, optimizing its application rate (timing and frequency) and its impact on soil health and crop productivity still need further investigation. Cement kiln dust (CKD) is a potential ideal source of lime for use in rectifying acidic soils. CKD is affordable and readily available for farmers in Alberta. However, there is need for evaluations to determine the ideal application rates. Field-based research on CKD still remains unclear. We currently thus do not have a baseline for the benefits of liming in major crops grown in the prairie provinces. Therefore, this project aims at investigating the benefits of liming on ameliorating acidic soils and improving soil health. Soil samples were collected from limed and control plots at depths of 0–15, 15–30 and 30–60 cm. Measured soil health indicators include pH, CEC, exchangeable cations, readily soluble Al and Mn, soil texture, available NPKS, organic C, total C, total N and soil microbial community structure (16S rRNA and ITS) in lime versus no lime plots. Analyses were performed at the University of Alberta Natural Resources Analytical Laboratory.

Vermicompost and biochar affect soil respiration, microbial biomass C and N, and microbial function in agricultural soils from central Alberta

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A major global problem is the rising rate of waste generation, for example, one-third of the food produced worldwide is either lost or wasted at various points along the supply chain, including in households. In order to reduce the amount of waste to landfill and help soil health, application of compost and biochar, a regenerative agriculture practice is suggested. Regenerative agriculture practices such as multi cropping, no till farming and biochar/compost application may lead to increased or preserved soil health, which encompasses soil fertility, available water for plants, microbial biodiversity, and soil organic carbon sequestration. This study was designed to determine if compost blends changed soil health in soils under conventional and regenerative practices. A 65-day lab incubation of two replicated soil types were amended with five treatments of blended composts and biochar, along with an unamended control. CO_2-C fluxes were quantified using soil gas analyzers and NO_3 and NH_4 were measured via colorimetry using an Autoanalyzer every week. Microbial biomass carbon and nitrogen were measured using chloroform fumigation extraction. Community Level Physiological Profiles (CLPP) were measured with a microplate-based multi-substrate induced respiration experiment using a plate-reading spectrophotometer. Results indicated a positive correlation between biochar/compost treatments and rate of C mineralization and microbial biomass. Blended treatments had better performance and increased microbial activity compared to sole treatments. Biochar alone treatments decreased total microbial biomass in both soils. Regenerative agriculture soil which had higher OM and pH produced increased mineralized of C and N, and had higher MBC+N, and qCO2. These indicate that regenerative soil was more active than conventional agriculture soil, but the treatments stimulated more N min in conventional soil.

How can microbial diversity be used as an indicator of soil health in different land management conditions?

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Thank you for attending the ALES Graduate Research Symposium 2023!