ALES GSA presents

ALES RESEARCH SYMPOSIUM 2024

March 19 & 20, 2024

ENGINEERING TEACHING AND LEARNING COMPLEX (ETLC)
ROOMS E6-064 & E6-059

alesgsa@ualberta.ca

8th Annual Graduate Research Symposium of the Faculty of Agricultural, Life & Environmental Sciences

University of Alberta, CA

19 – 20 March, 2024

Book of Abstracts

UNIVERSITY OF ALBERTA

Agricultural, Life & Environmental Sciences Graduate Students' Association

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 presenters and attendees,

It is my pleasure to introduce the eighth annual ALES Graduate Research Symposium. This highly anticipated event has become a mainstay on the faculty calendar thanks to the high caliber of research underway and the enthusiasm with which graduate students share it. Congratulations to each of this year's participants, and thank you to the ALES Graduate Students' Association for organizing this event.

Your research is worthy of celebration, after all. These projects have potential to revolutionize the world around us, from changing the environment home and abroad to innovating how we live and work. Many of you are contributing to UN Sustainable Development Goals (SDGs) with your efforts in land reclamation, food and animal science, sociology and well-being, to name just a few. Your expertise is recognized by industry and funders alike, and the faculty is proud to support you in your endeavors.

Grad students, relish the spotlight during this symposium and well into your work and degrees. Continue to be curious and aspirational, and ask for help when you need it. The ALES GSA, faculty and staff, and your fellow students make for a supportive network and an inspiring community of colleagues. This two-day event welcomes each of you to look away from microscopes, return from field research or take a break from spreadsheets and data to celebrate our collective strength. I hope you take full advantage of the opportunity.

One important aspect of graduate study is the opportunity to engage with other students. This community often continues to be important throughout your career. The symposium is one more way to build relationships and expand your network.

Best wishes to the research symposium presenters, and thanks again to the organizers and volunteers who made this event possible.

Stanford F. Blade, PhD

Dean, Faculty of Agricultural, Life & Environmental Sciences

Welcoming Message from Nat Kav, Associate Dean

Dear ALES graduate students, research assistants, postdoctoral fellows and all other research personnel. I am absolutely thrilled to hear that the ALES Graduate Research Symposium is happening once again this year. This is one of those events that many of us eagerly await as it affords the opportunity to hear about the exciting things that you have all been doing. As you already know, you are all such vital parts of the University's research engine and the fact that the Faculty of ALES is a leader in research at the University of Alberta is a testament to your hard work and diligence. I look forward to the symposium and meeting many of you in person. I also know that it takes a great deal of effort to organize a symposium of this nature and, for this, I am extremely grateful to our own ALES GSA. A big thank you to you all and best wishes for a very successful symposium.

Nat Kav, FRSB., FRSC

Associate Dean (Academic) & Associate Dean (Graduate Studies)

Welcoming Message from Rene Dery, CNAS Director of Research and Innovation

Dear Faculty of Agricultural, Life & Environmental Sciences (ALES) Graduate Students and Research Symposium Participants,

Welcome to the 8th annual ALES Graduate Research Symposium. As part of the College of Natural and Applied Sciences (CNAS), the Faculty of ALES is at the forefront of shaping Alberta in a broad range of areas from our health and what we eat, to what we wear and how we work and interact with our communities, our environment, our resources and the world around us. ALES is one of the most research-intensive faculties at the University of Alberta, with approximately $50M per year of external funding from agencies and partners who support us. We are proud of the impact of our research – research that you as Graduate Students are an integral part of creating.

As Graduate Students, you have chosen to embark on a challenging and rewarding journey that is shaping the future. Research is by nature innovative and incremental, and like so many of our graduates before you, your research is an important building block that lays the foundation for innovative and significant impact on our lives as a global community. The research you have undertaken with all of your hard work has a story to tell, but it needs your voice to tell it. Today is an opportunity for those of you who are presenting your work to give voice to that story.

To all symposium attendees, participants and supporters, enjoy these two days and take the opportunity to network and share in the innovative research that is happening in our Faculty. To our poster and oral presenters, we are all looking forward to hearing your stories!

Good luck and have fun!

Rene Dery, PhD

Director of Research and Innovation

College of Natural and Applied Sciences
Faculty of Agricultural, Life & Environmental Sciences

Welcoming Message from Sarah Ejekwuipe, ALES GSA President

Dear Esteemed Faculty Members, Students, and Distinguished Guests,

Welcome to the 8th Annual ALES GSA's Research Symposium at the University of Alberta! it is my pleasure to extend a warm and heartfelt welcome to each one of you. This symposium holds a special place in our hearts as it serves as a beacon, illuminating the groundbreaking research, diverse talents, and collaborative spirit that define our academic community.

Our symposium is a testament to the outstanding research endeavours of graduate students, spanning across four remarkable departments within the ALES Faculty. Throughout the day, we will witness captivating presentations, engage in thought-provoking discussions, and forge connections that transcend departmental boundaries. This year marks a milestone in our journey as we continue to build on the success of previous symposiums.

I extend my sincere gratitude to the dedicated Executive Team members whose hard work and resilience have made this symposium possible. To our esteemed Faculty members, sponsors, partners, judges, presenters, and esteemed attendees, your unwavering support is the driving force behind the success of ALES GSA's Research Symposium 2024. As we embark on this intellectual journey, let us embrace the spirit of curiosity, innovation, and collaboration.

Thank you for being part of this remarkable occasion. The ALES GSA's Team wishes you an enjoyable symposium experience and trusts that you will leave inspired by the varied and impactful contributions made by ALES graduate students.

Sarah Ejekwuipe,

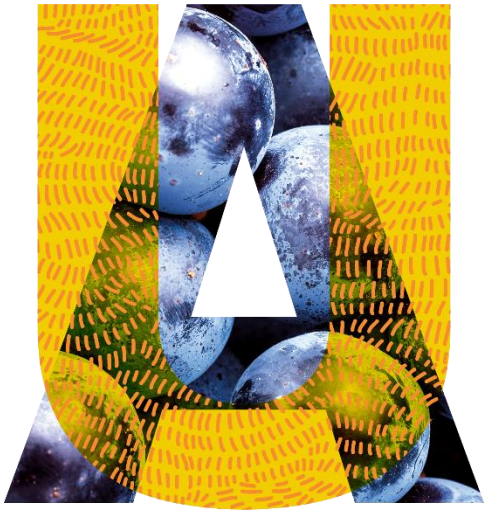
President, ALES Graduate Students' Association 2024

The ALES GSA 2024 Organizing Committee

Top row, from left to right: Jo Ann Chew (Vice President Communications), Chathuranga De Silva (Vice President Finance), Sarah Namiiro (Vice President Student Life).

Bottom row, from left to right: Elsie Osei (Student Representative: Human Ecology), Etseoghena Obi (Student Representative: Agriculture, Food & Nutritioanl Science), Surabhi Lukose (Student Representative: Renewable Resources), Sarah Ejekwuipe (President and Student Representative: Resource Economics and Environmental Sociology).

Special Thanks (Funders and Sponsors)



Thank you to the Faculty of Agricultural, Life & Environmental Sciences (ALES), as well as the following ALES departments for supporting the ALES GSA Graduate Research Symposium:

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

Thank you as well to our other U of A Partners:

- Faculty of Engineering
- Faculty of ALES Student Services
- Faculty of Graduate Studies & Research
- Office of the Dean of Students

Special thanks to:

- All faculty who have generously volunteered their time to judge posters and presentations throughout the event.
- Dr. Rene Dery and Yumi 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.
- Asadulla Khan, from Horowitz Events Centre 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 2024 runs from 10:00am to 4:00pm on March 19 and 10:00am to 3:00pm on March 20, 2024 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, pastries) are available throughout the event. They may be found in the hallway of ETLC E6-059.

Lunch (while supplies last) will be provided on both days of the symposium. They may be found in the hallway of ETLC E6-059.

Speakers:

Speakers and presenters are expected to check in at the front desk in front of ETLC E6-068 and receive their name tags prior to the start of their session.

Oral Presentation Guidelines:

Each oral presentation is 12 minutes plus 3 minutes for questions. All oral presentations are to be held in ETLC Room E6-068.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.

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 E6-059 at 12:00 pm to 1:30 pm on Tuesday, March 19, 2024. 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 12:00 pm – 1:30 pm. 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 door prizes of gifts cards and goodies to be won. Winners will be selected for a lucky draw when they cast their ballots for the People's Choice for Poster, or when they attend any oral session. 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.

Program Overview

Tuesday March 19, 2024	
Time	Session
10:00 AM	Oral Presentations: Renewable Resources
12:00 PM	Poster Presentations* and Lunch
1:30 PM	Oral Presentations: Agricultural, Food & Nutritional Sciences (Plant themed)
3:45 PM	Draw Prizes**

Wednesday March 20, 2024	
Time	Session
10:00 AM	Oral Presentations: Agricultural, Food & Nutritional Sciences
12:00 PM	Lunch
1:00 PM	Oral Presentations: Human Ecology
2:30 PM	Closing Remarks and Awards Ceremony**

* Vote for your favourite poster! As a voter, your name will be entered into a draw for door prizes at the end of the event on both days of the symposium (winners must be present to receive prizes, so be sure to stick around at the end!)

** All attendees present during this event will be entered into a draw for door prizes at the end of the day (winners must be present to receive prizes, so be sure to stick around at the end!)

DAY 1 MARCH 19, 2024	
10:00-10:15	**WELCOME & OPENING (ETLC E6-064)**
10:15-10:30	"Modelling The Dual Impact Of Climate Change On Potato Productivity And Associated Nitrous Oxide Emissions In Southern Alberta" Matt Ball
10:30-10:45	"Mixing Tree Species Along With Density Management To Reduce Drought Susceptibility In Coastal Plantation Forests Of British Columbia" Surabhi Lukose
10:45-11:00	"Biochar For Remediation Of Heavy Metals From Oil Sands Process Water" Abhijeet Pathy
11:00-11:15	"Alternative Anaerobic Microbial Redox Processes Can Mitigate Methane Emissions From Oil Sands Tailings Ponds And End-Pit Lakes" Iram Afzal
11:15-11:30	"Exploring The Effects Of Cement Kiln Dust On Microbial Communities And Soil Chemical Properties" Priscillar Wenyika
11:30-11:45	"Pathogenic Soil Fungi Coincide With Presence Of Non-Native Plant Species In Partially Restored Montane Grasslands Of Banff National Park " Ana Bermudez Contreras
11:45-12:00	**BREAK**
12:00-13:30	**LUNCH & POSTER SESSION (ETLC E6-059)**
13:30-13:45	"Over-Expressing Mir408 To Enhance Photosynthetic Efficiency And Climate Change Resilience In Alfalfa " Sameena Alam
13:45-14:00	"Identifying Superior Photosynthetic Traits In Canola (Brassica Napus) Gene Pool" Fernando Guerrero Zurita
14:00-14:15	"Inclusion of legumes in forage mixtures to enhance resilience to drought stress" Chathuranga De Silva
14:15-14:30	"Cropping System Diversification With Perennial Forage Seed Crops For Improving Productivity And Soil Health In The Peace Region Of Alberta" Keshav Bhattarai
14:30-14:45	"Genetic Analysis Of Clubroot Resistance In The C Genome Of Brassica Napus And Identification Of Molecular Markers" Sonia Navvuru

14:45-15:00	"Polymer Seed Film Coating mixed with micronized zeolite as a management tool against Aphanomyces Root Rot in Field Pea" Sonika Pariyar
15:00-15:15	"Effects of non-native cicer milkvetch (Astragalus cicer L.) on vegetation and soil ecology on the Canadian dry mixedgrass prairie" Michele Tran
15:15-15:30	"Potential of Humalite as a soil amendment to improve crop productivity" Sumedha Vaishnavi Nallanthighal
15:45-16:00	DRAW PRIZES

DAY 2 MARCH 20, 2024	
10:00-10:15	"Genetic parameter estimation and genome-wide association studies of acute phase proteins in early lactation Canadian Holstein cows" Rui Liu
10:15-10:30	"Evaluation of blood parameters associated with environmental stress in grazing beef heifers with divergent residual feed intake " Maria Londono-Mendez
10:30-10:45	"Activity behavior and growth performance during summer of grazing beef heifers with divergent residual feed intake" Sergio Lasso
10:45-11:00	"Effects of protected and unprotected butyrate supplementation on growth performance and fermentation profile in dairy calves" Diego Martinez Mayorga
11:00-11:15	"Bioavailability and Metabolism of Bioactive Peptide IRW with Angiotensin-Converting Enzyme 2 (ACE2) Up-regulatory Activity in Spontaneously Hypertensive Rats" Zihan Wang
11:15-11:30	"Thermogenic effects of milk, yogurt, and cheese on glucose and energy homeostasis in high-fat diet-induced obese mice" Emad Yuzbashian
11:30-11:45	"Consumer Perception and Sensory Drivers of Liking of Fortified Oat Milks" Christy Alsado
11:45-12:00	"Oxylipins provide early detection of intestinal inflammation induced by chemotherapy and are attenuated by fish oil" Sarah Parsons
12:00-13:00	LUNCH
13:00-13:15	"Functional Fit through Alterations: Improving the safety and comfort of Women's Fire Protective Clothing" Jemma Forgie
13:15-13:30	" A Comparative Study on the Physical Properties of Pre-consumed and Virgin Merino Wools: The Eco-effectiveness of Upcycled Wool in Apparel" Wing Sem Mak
13:30-13:45	"Hydrothermal aging of PBO fabric – Effect of liquid water/water vapor and temperature" Rajitha Botheju
13:40-14:00	"Examining the odour-control efficacy of antimicrobial textile finishes " Jennifer Beaudette

14:00-14:15	"Monetary value of unpaid care in Canada: A comparison of valuation methods" Choong Kim
14:15-14:30	"Everyday Life Experiences of Chinese Immigrant Families with Young Children" Yanchi Mou
14:30-14:45	CLOSING REMARKS & DRAW PRIZES
14:45-15:00	AWARDS CEREMONY

POSTER SESSION	
1	INFORMATION
2	"Machine Learning to Optimize Extrusion Parameters for Novel Plant-Protein Sources" Amanda Buchko
3	"Quantitative proteomics analysis reveals the prevention of chemotherapy induced catabolic changes by omega-3 fatty acids in a preclinical model of colorectal cancer" Peter Isesele
4	"Effect of Breeding Selection on Root System Architecture and Nitrogen Use Efficiency of Prairie Wheat and Barley Varieties" Suman Bagale
5	"Enhancing carbon sequestration and microbial activity through native plant restoration in Saskatchewan grasslands" Dauren Kaliaskar
6	"Influence of fuel data assumptions on wildfire risk assessment of the built environment" Air Forbes
7	"Polarized Light Pollution and its Effect on Aquatic Insects." Julia van der Merwe
8	"How do Phenotypes of Seed Orchard (Improved) vs Wild (Unimproved) Seedlings of Pinus contorta (Lodgepole Pine) differ under Commercial Greenhouse Condition?" Sarun Khadka
9	"Linking Ring Width to Mast Years in Yukon White Spruce " Carson Lopatka
10	** Cancelled **
11	"Aerobic exercise before and during neoadjuvant chemotherapy helps maintain several QoL indicators in women with breast cancer in the DHA WIN RCT" Claire Douglas
12	"Effect of grazing management on vegetation diversity and composition" Caroline Wade
13	"Bovine-derived Lactobacillus mixture as a strategy to minimize beef calf stress at weaning" Vanesa Ramirez
14	"The role of EPA and DHA to modify inflammation and adipokines in chemotherapy induced adipose tissue wasting in a pre-clinical model of colorectal cancer" Stanley Woo

15	"The effect of humic-based soil amendment on nodulation and plant growth in forage legumes" Oshadhi Athukorala Arachchige
16	"Exploring Hemp for Regenerated Cellulosic Fiber Manufacturing through Lyocell Process: A Sustainable Alternative for Agriculture and Textile Industries." Md. Abu Sayed
17	"From Waste to Wealth: Recycling Cotton Garments for Sustainable Textile Fibre Manufacturing" K M Abdun Noor
18	"Memory Care Environments: Constraints and Affordance of Home in Material Culture " Orsolya Welch
19	"Sod-Seeding Perennial Legumes into Beef Cattle Pastures in Central Alberta" Georga Boffen Yordanov
20	"Optimizing Collagen Peptide Extraction from Spent Chicken: Revealing Anti-Aging Potentials" Yuanyuan Lou
21	"Effects of grazing management on soil carbon storage, size fractions, microbial communities and necromass in northern temperate pastures" Sangita Chowdhury
22	"Agronomic Response of Canola, Oats, and Wheat to Lime Amendments under black and gray soils in Alberta, Canada" Jedida Chirchir
23	" Improving management tools for low-density mountain pine beetle populations in novel habitats: investigating anti-attraction properties of fungal volatile compounds " Leah Crandall
24	"Phytoremediation of hydrocarbons in peatlands" Mahdiyeh Safaripour
25	** Cancelled **
26	"Climate data for Africa and using machine learning techniques in climate data interpolation" Sarah Namiiro

Oral Presentations

Abstracts are presented in the running order of the programme.

Modelling the Dual Impact of Climate Change on Potato Productivity and associated Nitrous Oxide Emissions in Southern Alberta

Matt Ball, Guillermo Hernandez-Ramirez

mball1@ualberta.ca

University of Alberta, Department of Renewable Resources

Potato (Solanum tuberosum) yields face a distinct threat from climate change due to the crop's sensitivity to drought stress, waterlogging, and heat stress. The challenge is compounded by the observed potential synergistic relationship between escalating climate change and increasing agricultural greenhouse gas emissions.

To assess the impact of projected future climate change on potato yields and associated nitrous oxide (N2O) emissions in Southern Alberta, a 12-model ensemble mean of downscaled CMIP6 climate projections were input into the SUBSTOR-Potato model within the DSSAT crop modeling software. Projections for 2040, 2070, and 2100 under the emission scenarios of SSP1-2.6, SSP2-4.5, and SSP5-8.5 were input into the SUBSTOR-Potato model, following calibration and validation using field trial data from Lethbridge College's Demo Farm. Modeling runs represented the field trial, including modelling of three bedding practices—Fall bedding, Spring bedding, and Spring bedding with a preceding winter cover crop—to assess bedding specific climate resilience.

Overall, near-perfect negative linear correlations are modelled between temperature and potato yields, and between potato yields and N2O emissions. Additionally, there is a strong positive linear correlation between temperature and N2O emissions. Potato yields are expected to decrease by approximately 5% and 80% under SSP2-4.5 and SSP5-8.5, respectively, in 2100, compared to an observed baseline in 2023. In contrast, under SSP1-2.6, potato yields are projected to increase by around 3%. Simultaneously, N2O emissions are forecasted to increase by approximately 6%, 10%, and 25% under SSP1-2.6, SSP2-4.5, and SSP5-8.5, respectively, in 2100, compared to the observed baseline in 2023.

Mixing tree species along with density management to reduce drought susceptibility in coastal plantation forests of British Columbia

Surabhi Lukose[1], Dr Brad Pinno[2], Dr Kwadwo Omari[3]

slukose@ualberta.ca

Department of Renewable Resources, University of Alberta[1],[2]

Coast Area Research, Ministry of Forests, British Columbia[3]

The coastal forests of British Columbia have been experiencing longer and more intense droughts in recent years. To evaluate the effects of species composition and density to drought sensitivity, a study was conducted in a Douglas-fir: Western redcedar plantation established in 1992, in the eastern variant of the Coastal Western Hemlock very dry maritime (CWHxm1) bio-geoclimatic subzone along the east side of Vancouver Island. This plantation consists of a 4x3 factorial design with four different species mixtures (Douglas-fir: Western redcedar mixtures of 1:0, 1:1, 1:3, and 0:1) at three different planting densities (500, 1000, and 1500 stems/ha). In summer 2022, soil moisture measurements were taken, and tree cores were collected from the field. Our results indicate that soil moisture increases with decreasing stand density except for pure Douglas-fir stands which had consistently low soil moisture at all densities. As per drought indices calculated from tree core data, it was observed that pure Western redcedar stands had a higher drought resistance, resilience and recovery compared to pure Douglas fir stands. Wood carbon isotopic data indicates that pure Western redcedar stands have higher water use efficiency in comparison to pure Douglas-fir stands with greater difference during dry years compared to wet years. Western red cedar trees were highly responsive to drought while Douglas fir trees were quite stable and benefited from mixing with Western redcedar. Reducing stand basal area, which can be achieved by mixing the two species can help reduce the drought susceptibility of these forests to long-term drought.

Biochar For Remediation Of Heavy Metals From Oil Sands Process Water

Abhijeet Pathy; M. Anne Naeth; Scott X. Chang

pathy@ualberta.ca

Department of Renewable Resources, University of Alberta

Resource rich provinces of Canada face a pressing need for soil and water remediation due to contamination from industrial activities, particularly heavy metals in process waters. This study addresses the urgent need for effective remediation solutions by investigating the efficacy potential of two novel biochars in remediating heavy metals from oil sands and process water. Biochar, produced through the thermochemical decomposition of biomass, offers promising adsorption properties for heavy metals. While previous research has mainly been conducted at laboratory scales, this study expands upon existing knowledge by testing the biochars in batch and column experiments. This study is unique as it focuses on remediation of multiple heavy metals in water and how they interact, whereas previous research usually dealt with just one metal. The findings from this study will contribute to development of sustainable contaminant remediation strategies and inform policy decisions aimed at protecting the environment and public health in regions facing heavy metal pollution from industrial activities.

Alternative anaerobic microbial redox processes can mitigate methane emissions from oil sands tailings ponds and end-pit lakes

Iram Afzal, Navreet Suri, Alsu Kuznetsova, Ania Ulrich and Tariq Siddique

iafzal@ualberta.ca

Department of Renewable Resources, University of Alberta, Edmonton, Alberta, Canada

Department of Civil & Environmental Engineering, University of Alberta, Edmonton, Alberta

** Redacted **

Exploring the effects of cement kiln dust on microbial communities and soil chemical properties

Priscillar Wenyika

wenyika@ualberta.ca

Department of Renewable Resources, University of Alberta

Soil acidification (i.e., low soil pH) negatively impacts soil pH and microbial communities, soil processes and crop production globally. In Canada, occurrence of acidic soils has been reported since the 1960s in Alberta and northeastern British Columbia. 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. Application of lime is a common agricultural practice used to ameliorate soil acidification. However, on-farm research on the impacts of lime application on soil microbial communities is still limited. This project aimed at investigating the effects of cement kiln dust (CKD) on microbial communities in four different farms in Central Alberta. Soil pH and microbial community structure (16S rRNA and ITS) were assessed before and after CKD application. CKD increased soil pH by about 4–15%. Overall, liming had no significant effects on abundance and alpha diversity of bacterial and fungal communities. The bacterial community majorly comprised of Actinobacteria, Acidobacteria, Proteobacteria, Chloroflexi, and Firmicutes. Fungal phyla Ascomycota, Basidiomycota and Mucoromycota were present and dominant in both limed and unlimed soils. Liming slightly decreased Acidobacteria abundance and marginally increased abundance of Proteobacteria and Mucoromycota fungi in some of the fields. Preliminary results show that liming can be used to ameliorate acidic soils and affects microbial communities, but effects may not be evident over short-term periods.

Keywords: soil pH, soil health, microbial communities, soil chemical properties

Pathogenic soil fungi coincide with presence of non-native plant species in partially restored montane grasslands of Banff National Park

Ana Bermudez-Contreras, Brian Yakiwchuk, Justine Karst

bermudez@ualberta.ca

University of Alberta, Parks Canada

In native grasslands, soil fungi can affect plant community composition via plant-soil feedbacks, potentially affecting the recovery of plant communities following restoration. The montane grasslands of Banff National Park (BNP) provide unique open areas that contrast with neighboring ecosystems within the Rocky Mountains region. These grasslands harbor high biodiversity and provide key habitat, while occupying only 3% of the total area of BNP. Restoration of montane grasslands in BNP is thus high priority, however, re-establishing native plant communities is challenging. Given the potential role soil fungi play in grassland restoration, we identified soil fungal communities using metabarcoding and surveyed plant communities in partially restored sites that are currently dominated by non-native plants and compared them to sites representing restoration targets for plant community composition and diversity, namely native grasslands and savannah-type ecosystems. Indicator species of native grasslands included Leymus innovatus, Calamagrostis rubescens and Arctostaphylos uva-ursi, and had higher plant species diversity than partially restored sites. Indicator species of partially restored sites were non-native Poa pratensis and Taraxacum officinale, and had higher diversity of soil pathogenic fungi than either target ecosystems. Community composition of plants and pathogenic soil fungi in partially restored sites differed from both target ecosystems. Pathogenic soil fungal communities may underlie the persistence of non-native plants in partially restored sites, potentially stalling restoration of montane grasslands in BNP.

OVER-EXPRESSING MIR408 TO ENHANCE PHOTOSYNTHETIC EFFICIENCY AND CLIMATE CHANGE RESILIENCE IN ALFALFA

Sameena Alam 1, Kimberly Burton Hughes K 1, Udaya Subedi 1,2, Madeline Lehmann 1,2, Christie Stephen 1,3, Alicja Ziemienowicz 1, Gavin Chen 2, Stacy Singer 1

sameena1@ualberta.ca

1-Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge AB, Canada,

2-University of Alberta, Edmonton AB, Canada,

3-University of Lethbridge, Lethbridge AB, Canada

The global population is projected to reach nearly 9.8 billion by 2050, which will pose a challenge for food security. Meeting this demand will not only require efforts to reduce food waste and establish equitable food distribution, but will also necessitate increased agricultural productivity. Unfortunately, yield gains across many crop species have stagnated in recent years, and improving photosynthetic efficiency could be pivotal for enhancing their yield potential. MicroRNA408 (miR408) has been shown previously to act as an important positive regulator of photosynthesis in several plant species, largely through the down-regulation of various genes encoding copper-containing proteins. In this project, my aim is to elucidate the function of miR408 in the context of photosynthesis in alfalfa, which is one of Canada's most valuable forage crops. MiR408 over-expression vectors were generated and successfully introduced into alfalfa using Agrobacterium-mediated transformation. To confirm the over-expression of miR408 in transgenic plants, both conventional and stem-loop quantitative reverse transcription PCRs (qRT-PCRs) were performed. The cleavage of putative miR408 target genes identified using in silico analyses will be validated using 5' RLM-RACE, and RNA-Seq will also be carried out to further our understanding of the transcriptional changes incurred through the modulation of miR408. Ultimately, the long-term goal of this research is to identify genes regulated by miR408 in alfalfa, which when knocked out using CRISPR/Cas9 could enhance photosynthetic efficiency and biomass production, thus contributing to global food security.

Identifying superior photosynthetic traits in canola (Brassica napus) gene pool

Fernando, Guerrero-Zurita; Salvador, Lopez: Karanjot, Gil; Rebecca, Enesi; and Linda, Gorim

fguerrer@ualberta.ca

Department of Agriculture, Food, and Nutritional Sciences, University of Alberta, Agriculture/Forestry Centre, Edmonton, AB T6G 2P5, Canada

B. napus (canola) is the second major source of high-quality vegetable oil globally. Improvements in canola have majorly emerged from breeding and manipulation of both plant morphology and management are at saturation. This study assesses photosynthetic efficiency as a strategy to improve crop performance. A Brassica napus gene pool of 170 accessions (two checks included) encompassing seven parental lines were grown in three locations across Edmonton, Alberta in 2021, 2022, and 2023 using an incomplete randomized block design. Accessions were tested for agronomy parameters and photosynthetic efficiency using both chlorophyll fluorescence and gas exchange parameters. Principal component analysis revealed three groups with different behaviour: i) those able to allocate more CO2 to increase biomass with low heat dissipation, ii) those which maintained the operating efficiency of photosystem II resulted in heavier seeds, and iii) accessions where an optimum stomatal regulation was linked to a healthier photosystem II. Crosses exhibiting higher responses in various parameters compared to the checks were identified, notably B. napus (spring variety) x B. rapa and [B. napus (winter variety) x B. napus (spring variety)] x B. napus (rutabaga). These crosses, represented by specific accessions, demonstrated superior photosynthetic and physiological characteristics. This study contributes novel photosynthetic and physiological insights, offering valuable information to canola breeders and crop producers. The identified accessions with exceptional sunlight harvesting capacity present promising prospects for enhancing canola yield in future breeding endeavors.

Inclusion of legumes in forage mixtures to enhance resilience to drought stress

Chathuranga De Silva, Malinda Thilakarathna

batapola@ualberta.ca

PhD Student, PhD Student, Associate Professor

Drought stress poses a significant challenge to forage production, making it imperative to deepen our understanding of how forage plants react to such conditions. A greenhouse pot experiment was conducted to assess the response of mixed legume-grass forage stands to drought stress in comparison to grass monoculture. Red clover (Trifolium pratense L.)—timothy grass (Phleum pratense L.) mixed stand and a timothy monoculture stand were subjected to severe drought (20% field capacity—FC), moderate drought (40% FC), and well-watered (80% FC) conditions for four weeks, followed by a four-week recovery period during which moisture levels were restored to 80% FC. Moderate and severe drought significantly decreased the shoot biomass of the mixed stand, whereas no difference was observed in the timothy monoculture. However, mixed stands subjected to moderate drought were able to recover shoot growth during the recovery phase. Compared with grass monoculture, the total biomass of legume-grass mix stand was significantly higher in well-watered control, and moderate and severe drought treatments in both drought and recovery phases. Drought stress led to reductions in shoot biomass and nitrogen fixation capacity in red clover. Grass in the mixed stand exhibited a significantly lower C:N ratio and higher leaf chlorophyll content compared to monoculture. Based on the results of this study, the inclusion of legumes in forage mixtures was highlighted as an effective approach to enhance resilience to moderate drought stress.

Cropping system diversification with perennial forage seed crops for improving productivity and soil health in the Peace region of Alberta

Keshav Bhattarai, Nityananda Khanal, Malinda Thilakarathna, Noabur Rahman

kbhattar@ualberta.ca

Agriculture and Agri-Food Canada

Diversification in cropping sequence with perennial forage seed crops has the potential to bring profitability and sustainability to the overall production system. To investigate this concept, a field experiment with eight cropping sequences under three nitrogen levels (0, 45, and 90 kg N/ha) was initiated in 2013 at Beaverlodge Research Farm, Alberta. Among eight cropping sequences, six were diversified with perennial legumes (red clover and alsike clover) and grasses (timothy, meadow bromegrass, and creeping red fescue), incorporating in traditional annual cropping system (wheat and canola) of the Peace region. The system's productivity was evaluated based on the seed yield, expressed as Canola Equivalent Yield (CEY) and gross revenue for uniform comparison among the sequences. Soil samples were collected from 0-15 cm depth post-harvest to evaluate soil physicochemical and biological properties. After nine (2022) and ten years (2023) of experimentation, the cumulative CEY and gross revenue were higher in meadow bromegrass-based sequences, attributed to recent increases in seed yield and price. Conversely, creeping red fescue-dominated sequences showed higher performance in the period from 2013 to 2021. Soil health indicators such as mean weight diameter of aggregates, soil organic carbon, microbial biomass carbon, active carbon, and the carbon and nitrogen cycling enzymes activities were significantly improved with the perennial forage-based sequences. However, soil bulk density, pH, electrical conductivity, and water content at field capacity showed no significant differences among cropping sequences. These findings suggest that incorporating perennial forage seed crops into the cropping system could lead to more resilient sustainable agriculture practices.

Genetic analysis of clubroot resistance in the C genome of Brassica napus and identification of molecular markers

Sonia Navvuru, Habibur Rahman

navvuru@ualberta.ca

Department of Agricultural, Food and Nutritional Science, 4-10 Agriculture/Forestry Centre, University of Alberta, Edmonton, AB T6G 2P5, Canada.

Brassica napus canola is the major Brassica species cultivated worldwide for its oil. Due to its widespread cultivation, it has become a venerable crop affected by several biotic and abiotic stresses. Among these, clubroot disease, caused by Plasmodiophora brassicae, is one of the most devastating stresses causing a yield loss of 29-90%. To date, clubroot resistance of the A genome of B. rapa has been used in the breeding of clubroot-resistant canola cultivars; nevertheless, the major gene resistance of the A genome has been reported to become ineffective after growing a cultivar only for a few years. On the other hand, the C genome of B. oleracea houses several quantitative trait loci (QTL) and exhibits a broad spectrum of resistance; yet, this resistance has not been exploited to date. The purpose of my research is to develop different segregating populations, such as F2, B1, B2, F3, B1F2, B2F2, by crossing a clubroot-resistant B. napus line, carrying resistance in the C genome, to a clubroot-susceptible canola line, and phenotype the populations for resistance to P. brassicae pathotypes 3A and 3H in order to understand the genetic control of this resistance. Further, these populations will be genotyped by molecular markers and linkage association of the genotypic and phenotypic data will be carried out to identify the polymorphic markers associated with the resistance. The results from this research will facilitate combining the resistances of the A- and C genomes to develop canola cultivars with higher stability of clubroot resistance.

Polymer Seed Film Coating mixed with micronized zeolite as a management tool against Aphanomyces Root Rot in Field Pea

Sonika Pariyar

pariyar@ualberta.ca

AFNS

Field peas, a crucial pulse crop in the Canadian Prairies, play a significant role in nitrogen fixation and breaking the disease cycle of major crops. Aphanomyces euteiches Dreches (AE) stands out as a major threat to pulse production in Canada, potentially causing yield reductions of up to 70% in wet years. Various management strategies such as the adoption of resistant variety and seed treatment have been explored to suppress AE. The substance with antifungal properties such as zeolite which is a crystalline aluminum silicate mineral with high cation exchange capacity is being explored as a strategy to manage AE. The objectives are to (1) Evaluate the impact of zeolite seed coating on seed functions and (2) Assess the effectiveness of zeolite seed coating on the management of Aphanomyces root rot. The reserve mobilization of seeds will be measured based on the dry matter fraction that is transferred to the leaves, roots, and shoots of seedlings up to around 23 days. The impact of zeolite seed coating on the management of AE will be estimated based on root discoloration symptoms produced by the three weeks' pea seedlings after inoculating them with AE suspension. It is hypothesized that the zeolite seed-coated seeds will exhibit better imbibition, germination, and reserve mobilization. Furthermore, it is expected that zeolite seed coating will have a positive impact on the disease management of AE. This study will provide the sustainable management strategy of AE with enhanced seed functions.

Effects of non-native cicer milkvetch (Astragalus cicer L.) on vegetation and soil ecology on the Canadian dry mixedgrass prairie

Michele Tran, Rhea Lumactud, Batbaatar Amgaa, Cameron Carlyle, Malinda Thilakarathna

metran@ualberta.ca

University of Alberta

Cicer milkvetch is an introduced perennial forage legume in Canada. Cicer milkvetch was previously found to increase forage biomass while reducing soil carbon and vegetation diversity in the Canadian dry mixedgrass prairie region. We sought to understand these ecological changes by examining the effect of cicer milkvetch on vegetation, soil carbon (C) and nitrogen, and microbial composition.

A field trial was conducted at the University of Alberta Mattheis research ranch, located in Southern Alberta, in the dry mixedgrass prairie region where cicer milkvetch had been introduced historically. Ten plots of cicer milkvetch were randomly selected, each with an adjacent plot of cicer-free grassland and a second grass plot fertilized with nitrogen at a rate similar to the amount of nitrogen provided by legumes. First-year (2023) results show total above-ground biomass was significantly higher in cicer milkvetch plots, with lower plant species richness compared to grass and fertilizer treatments. Available soil nitrogen was higher under cicer milkvetch plots and nitrogen-fertilized grass plots compared to the grass plots without nitrogen fertilizer. Soil carbon concentration and C:N ratio were not significantly different between cicer milkvetch and grass plots. Soil microbiome data showed no significant differences in alpha and beta diversity at the genus level among all treatments. Sampling was conducted in the second year (2023), and data is currently being processed to understand the effect of cicer milkvetch on the above parameters.

Potential of Humalite as a soil amendment to improve crop productivity

Sumedha Vaishnavi Nallanthighal, Karanjot Gill, Salvador Lopez, Rebecca Enesi, Linda Gorim

nallanth@ualberta.ca

Department of Agricultural, Food and Environmental Sciences

The increasing demand for food production requires efficient nitrogen (N) fertilizer strategies to optimize crop yield. However, excess usage of these fertilizers such as urea, raises concerns about additional production costs and environmental implications. Humalite, a naturally occurring humic substance containing high humic acid, has the potential to increase nutrient availability and uptake, thus improving crop growth. The aim of this study was to investigate the effect of humalite and urea to enhance crop production in wheat and canola. A three-year field study was conducted at three distinct sites/soil zones in Alberta a treatment combination of three urea rates and five humalite rates (15 treatments in total) under a split-plot design. Urea recommended rates (RR) were calculated based on the soil test analysis for each site. Humalite rates (No humalite, 50, 100, 200, and 400 lbs/ac) were side-banded with three urea rates (No urea, 50% RR, 100% RR). Yield results show that long-term application of urea and humalite significantly influenced grain yield across the different sites. The application of 100, 200, and 400 lbs/ac of humalite resulted in similar yield. There was no significant difference between 50% RR and 100% RR of urea application. Humalite rates of 100 lbs/ac is recommended for brown and gray soils and 200 lbs/ac for black soils. Collectively, this study suggests that humalite holds potential for enhancing crop productivity, optimizing urea utilization, and mitigating N losses. As an organic soil amendment, long-term studies may be essential to observe significant field-scale results.

Genetic parameter estimation and genome-wide association studies of acute phase proteins in early lactation Canadian Holstein cows

Rui Liu, Dagnachew Hailemariam, Ana Ruiz, Christine Baes, Marcos Colazo and Graham Plastow

rliu10@ualberta.ca

Department of Agricultural, Food and Nutritional Science, University of Alberta

Centre for Genetic Improvement of Livestock, University of Guelph, Guelph

The early lactation stage in dairy cows is a challenging phase due to negative energy balance and reduced immune function that could lead to metabolic and/or inflammatory diseases. Acute phase proteins (APPs) are markers of inflammation and can be used to monitor animal health. The objectives of this study were to estimate the genetic parameters of acute phase proteins (haptoglobin, C-reactive protein (CRP), and serum amyloid A (SAA)) and identify candidate genes for APPs using genome-wide association studies (GWAS). Blood samples were collected from 885 lactating Holstein cows from 11 commercial farms in Alberta between 2 and 14 days in milk. Serum concentrations of APPs were analyzed using Enzyme-Linked Immunosorbent Assay. The genotype data were collected using Illumina 100K Bovine Bead Chip with 78,146 SNPs after quality control. The heritability with the standard errors of haptoglobin, CRP and SAA, were 0.06 ±0.07, 0.31 ± 0.09, and 0.16 ± 0.07, respectively. The genetic correlations of SAA with haptoglobin and CRP were positive (0.51 and 0.12) however, between haptoglobin and CRP was negative (-0.26). Genome-wide association study for SAA identified QTL regions on chromosomes BTA24 and 29. Candidate genes (49) were identified within 100 kb distance of significant SNPs. These candidate genes play a role in inflammatory function, fertility, and performance in early lactating dairy cattle. Results demonstrated low to moderate heritability of APPs and identified associated genomic variants and pathways indicating the potential utility of these APPs to enhance the resilience of dairy cows through genetic selection.

Evaluation of blood parameters associated with environmental stress in grazing beef heifers with divergent residual feed intake

M. Londono-Mendez1, S. Lasso-Ramirez1, C. Fitzsimmons1,2, G. Plastow1, E. Bork1, J. Basarab1, and G. M. Silva1

londonom@ualberta.ca

1 Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB T6G 2P5, Canada.

2 Agriculture and Agri-Food Canada, Edmonton, AB T6G 2P5, Canada.

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Activity behavior and growth performance during summer of grazing beef heifers with divergent residual feed intake

Sergio Lasso1, Camila Londono1, Carolyne Fitzsimmons12, Graham Plastow1, Edward Bork1, John Basarab1, GLeise Silva1.

lassoram@ualberta.ca

1 Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB T6G 2P5, Canada.

2 Agriculture and Agri-Food Canada, Edmonton, AB T6G 2P5, Canada.

The sustainability of beef production systems generates interest in improved feed efficiency. However, there is a lack of research evaluating cattle activity budgets in response to the interaction between residual feed intake (RFI) and the environment while grazing. This study evaluated activity budgets and performance in grazing beef heifers with divergent residual feed intake. Forty-four crossbred beef heifers [358 ± 4.78 kg of body weight (BW); previously classified as more (n = 21; LOW-RFI = -0.9 ± 0.70) or less feed efficient (n = 23; HIGH-RFI = 1.3 ± 1.00) were grazed at 2.72 AUM/ha over 7 wks in Alberta, Canada. Pedometers were used to track heifer activity budget [n = 43; total steps, lying and standing time for 36 d]. Full BW was obtained on d -1, 0, 14, 28, 42, and 43, while fat scans on the rib and rump were measured by ultrasound on d 0 and 42. Comprehensive Climate Index (CCI) was considered to impose risk to cause mild, moderate, severe, and extreme stress for 5, 18, 7, and 1 day, respectively. For BW, average daily gain (ADG), rump (RF) and rib fat (RiF), the data were analyzed as a completely randomized design, while behaviour activity included repeated measures. An RFI x day interaction was observed for lying and standing times (P = 0.02) and total steps (P = 0.001). Greater number of steps (P < 0.01) and an increased standing time (P < 0.01) were observed in HIGH-RFI heifers. RFI × hour interaction was observed for lying and standing times (P = 0.006). Furthermore, LOW-RFI heifers had fewer steps per hour throughout the study (P = 0.03; 178 vs 191 ± 4.1). No effects were observed for ADG, BW, RF, and RiF (P > 0.24).

Effects of protected and unprotected butyrate supplementation on growth performance and fermentation profile in dairy calves

Diego Martinez Mayorga, Kayla Johnston, Anne Laarman

drmartin@ualberta.ca

AFNS, University of Alberta

Butyrate is known to promote growth performance in calves. Uncertainty persists on whether butyrate is more effective when unprotected, targeting the rumen, or protected, targeting the small intestine. The objective of this study was to evaluate rumen protected and unprotected butyrate supplementation on calf performance, as well as gastrointestinal fermentation parameters.

Calves were blocked by body weight, breed, and sex, and then assigned to one of three starter treatments: 1) No butyrate, 1% w/w palm fat as a placebo carrier (CON); 2) 1% w/w protected butyrate (2.5% of product; PRO); or 3) 1% w/w unprotected butyrate (1.5% of product) + 1% w/w palm fat (UNP).

At day 42, UNP calves had lower rumen pH than CON and PRO. Ruminal propionate and butyrate concentrations were higher in UNP than PRO, and higher in PRO than in CON. At day 70, ruminal pH in PRO was higher than both CON and UNP, while duodenal pH tended to be higher in CON compared to PRO. UNP had a higher propionate concentration than CON. PRO tended to have a higher concentration of propionate than CON. At day 70, body weight was higher for CON and PRO compared to UNP. Both CON and PRO had greater starter intake than UNP. These results suggest that fermentation profile is similarly altered by both butyrate supplements, but unprotected butyrate appears to compromise growth performance during weaning. Using a protected butyrate product may increase calf starter intake and growth which may decrease the time calves consume calf starter.

Bioavailability and Metabolism of Bioactive Peptide IRW with Angiotensin-Converting Enzyme 2 (ACE2) Up-regulatory Activity in Spontaneously Hypertensive Rats

Zihan Wang a,b,§, Chu-Fan Wang c,§, Hongbing Fan d, Xiaoyu Bao a, Fatemeh Ashkar a,b, Liang Li c, Tony K.L. Kiang e, Jianping Wu a,b,*

zihan18@ualberta.ca

a Department of Agricultural, Food and Nutritional Science, 4-10 Ag/For Building, University of Alberta, Edmonton, Alberta T6G 2P5, Canada

b Cardiovascular Research Centre, University of Alberta, Edmonton, Alberta T6G 2R7, Canada

c Department of Chemistry, University of Alberta, Edmonton, Alberta T6G 2P5, Canada

d Department of Animal and Food Sciences, University of Kentucky, Lexington, Kentucky 40546, United States

e Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta, Edmonton, Alberta T6G 2E1, Canada

Peptide IRW is the first food-derived angiotensin-converting enzyme 2 (ACE2) up-regulator. This study aimed to investigate the pharmacokinetic characteristics of IRW and identify the metabolites contributing to its antihypertensive activity in spontaneously hypertensive rats (SHRs). Rats were administrated 100 mg IRW/kg body weight via intragastric or intravenous route. The bioavailability (F%) was determined to be 11.7%, and the half-lives were 7.9 ± 0.5 and 28.5 ± 6.8 min for gavage and injection, respectively. Interestingly, significant blood pressure reduction was not observed until 1.5 h post oral administration, or 2 h post injection, indicating that the peptide's metabolites are likely responsible for the blood pressure-lowering activity. Time-course metabolomics revealed a significant increase in kynurenine, a tryptophan metabolite, in blood after IRW administration. Kynurenine increased ACE2 in cells. Oral administration of tryptophan (W), but not dipeptide IR, lowered blood pressure and upregulated ACE2 in SHRs. Our study supports the key role of tryptophan and its metabolite, kynurenine, in IRW's blood pressure-lowering effects.

Thermogenic effects of milk, yogurt, and cheese on glucose and energy homeostasis in high-fat diet-induced obese mice

Emad Yuzbashian1, Dineli N. Fernando2, Siegfried Ussar3,4, Catherine B. Chan1

yuzbashi@ualberta.ca

1Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta, Canada

2Department of Cell Biology, University of Alberta, Edmonton, Alberta, Canada.

3RG Adipocytes and Metabolism, Institute for Diabetes and Obesity, Helmholtz Diabetes Center, Helmholtz Zentrum München, German Research Center for Environmental Health GmbH, Neuherberg, Germany

4German Center for Diabetes Research (DZD), Neuherberg, Germany

5Department of Physiology, University of Alberta, Edmonton, Alberta, Canada

Obesity and Insulin resistance (IR) are major risk factors for type 2 diabetes. Brown adipose tissue (BAT) activation can increase energy expenditure (EE) and improve glucose regulation, potentially preventing or treating obesity and IR. Dairy foods contain natural compounds that may have thermogenic effects by activating BAT. We aimed to investigate the effect of milk, cheese, and yogurt consumption on EE and glucose homeostasis in mice fed a high-fat diet (HFD).

Methods: C57BL/6 mice (n = 16 per group) were fed HFD or HFD supplemented with fat-free milk (MILK), fat-free yogurt (YOG), or reduced-fat cheese (CHE; 19% fat) for 8 weeks. The dairy foods were provided at 10% of the daily energy intake. IR was assessed by the insulin tolerance test and the homeostasis model assessment of insulin resistance (HOMA-IR). EE and respiratory quotient (RQ) were measured in a metabolic chamber. BAT mitochondrial function and uncoupling protein 1 (UCP1) abundance were examined. Serum lipidomics profiles were analyzed to identify lipid mediators of BAT activation. Isolated, cultured primary brown adipocytes were treated with putative bioactive compounds found in dairy and mitochondrial function was measured by oxygen consumption rate (OCR) using Seahorse XF Cell Mito Stress Test.

Results: After 8 weeks of feeding, the MILK and YOG groups had lower weight gain, fat mass, HOMA-IR, and higher EE and RQ than the HFD group ($p<0.05$). The MILK group had the highest BAT thermogenic potential, as indicated by higher UCP1, PPARγ, and SIRT1 abundance in BAT, as measured by immunoblotting ($p < 0.05$). Lipidomics of serum revealed distinct and common lipid patterns among the dairy groups, suggesting both MILK and YOG shared and unique mechanisms of BAT activation. In brown adipocytes,

lysophosphatidylcholine 15:0, phosphatidylcholine 15:0/15:0, and 12-methyltetradecanoic acid increased OCR and UCP1 expression via the PPARγ-PGC1α-SIRT1 pathways.

Conclusions: In mice fed a HFD, milk and yogurt consumption can prevent obesity and IR by modulating EE. The beneficial effect of milk was related to increased BAT activation. Specific lipid compounds in dairy foods may mediate BAT activation via the PPARγ-PGC1α-SIRT1 pathways. (Supported by Dairy Farmers of Canada).

Consumer Perception and Sensory Drivers of Liking of Fortified Oat Milks

Christy Alsado, Laura Lopez-Aldana, Lingyun Chen and Wendy Wismer *

christym@ualberta.ca

Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB T6G 2P5, Canada

Oat milk was fortified with β-glucan at a level that attains health benefits and protein at a level equivalent to that of cow's milk. This study aimed to identify consumer perceptions, evaluate the sensory attributes, and identify drivers of liking of fortified oat milks. Participants (n = 106) evaluated four samples: C (Control), 0Pro (6.25 g/L β-glucan), LPro (6.25 g/L β-glucan and 15.23 g/L oat protein), and HPro (6.25 g/L β-glucan and 30.45 g/L oat protein); and completed free-word association (FWA), liking ratings, just-about-right (JAR), and check-all-that apply (CATA). Results showed that oat milk was associated with sensory descriptors, environmental sustainability, and health benefits. For overall liking, C and 0Pro were liked significantly more than LPro and HPro. C and 0Pro oat flavor and thickness were also rated 'just about right' by majority of the participants, while LPro and HPro were rated 'too much'. The positive drivers of liking were 'natural', 'soft', and 'oat-like,' while negative drivers of liking were 'rancid', 'artificial', and 'strong'. Comparatively, 0Pro was perceived as 'smooth', 'fresh', and 'easy,' while LPro and HPro were perceived as 'rancid', 'artificial', 'strong', all aligning with the negative drivers of liking. Based on the results, oat milk fortified with β-glucan was acceptable, while oat milks fortified with oat protein require reformulation and/or substitution with another protein source.

Oxylipins provide early detection of intestinal inflammation induced by chemotherapy and are attenuated by fish oil

Sarah Parsons1, Irma Magaly Rivas-Serna1, Peter Isesele1, Md Monirujjaman1, Aducio Thiesen2, M. Thomas Clandinin1,3, Vera Mazurak1

srcampb1@ualberta.ca

1. Agricultural, Food & Nutritional Science, University of Alberta, Edmonton, AB T6G 2H5, Canada; 2. Department of Laboratory Medicine and Pathology, University of Alberta, Edmonton, T6G 2P5, Canada; 3. Department of Medicine, University of Alberta, Edmonton, T6G 2P5, Canada

Cytokines involved in intestinal inflammation induced by chemotherapy (irinotecan+5-fluorouracil) are well characterized but the contribution of oxylipins to inflammation is lacking. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are known to alter cytokines and the balance of oxylipins. The present study investigated the effect of dietary EPA+DHA on oxylipins and cytokines in colon tissue after one cycle of chemotherapy. Fischer rats were fed a semi-purified control diet or an isocaloric diet differing only in EPA and DHA content (3% w/w) initiated on the same day as chemotherapy (day 0). Ward colon tumor was implanted and allowed to grow for ~2 weeks prior to providing chemotherapy at a clinically relevant dose. Rats were euthanized on day 0 and, following chemotherapy, on days 2 and 8. Colon samples were assessed for cytokines, histological injury, phospholipid fatty acids, and oxylipins. Inflammatory oxylipins spiked after chemotherapy despite unaltered levels of inflammatory cytokines and histology, showing limited evidence of injury. Feeding EPA+DHA resulted in 9- and 2-fold increase in EPA and DHA, respectively, by day 8 which attenuated the elevation of arachidonic acid (AA) post-chemotherapy. EPA+DHA prevented the early spike in total oxylipins derived from AA, including prostanoids and 5-HETE, and sustained TXB2 and PGE2 below baseline. Total oxylipins derived from EPA and DHA were higher (10- and 2-fold, respectively) for rats fed EPA+DHA by day 8. Results from one cycle of chemotherapy provide novel evidence that displacement of AA by EPA and DHA in membrane phospholipid attenuates early intestinal inflammation, potentially benefiting chemotherapy patients.

Functional Fit through Alterations: Improving the safety and comfort of Women's Fire Protective Clothing

Jemma R. P. Forgie, Patricia I. Dolez

jemma@ualberta.ca

Department of Human Ecology, University of Alberta

Firefighters rely on fire protective clothing (FPC) to protect them against extreme environments. However, the functionality of FPC depends on a good user fit. Poorly fitted FPC increases the risk of heat stress, chemical exposure, and injuries due to slips and falls. It reduces mobility, which affects their safety too. Women in firefighting, a growing minority in the field, have faced significant challenges in finding well-fitted FPC. As a result, women tend to alter their FPC to overcome concerns around mobility, comfort, and functionality. However, the impact of these alterations on the safety of the garments has not been studied. This project aims to understand the types of alterations that female firefighters perform on their FPC, and how the alterations impact user experience. The project will be completed in three phases. Firstly, surveys and interviews will be done with female firefighters across North America to understand the frequency and nature of alterations performed on FPC. Next, the collected data will be used to build lab-scale models of the alterations. These models will be tested against existing standards for FPC to understand how the safety of the garment may change as a result of alterations. Overall, the project will assess how alterations can be used to improve the fit of FPC without compromising safety. Although this project is focused on the needs of female firefighters, the knowledge gained can be applied to cater to individuals with body shapes and sizes not covered by standard sizes when using FPC.

A Comparative Study on the Physical Properties of Pre-consumed and Virgin Merino Wools: The Eco-effectiveness of Upcycled Wool in Apparel

Wing Sem Mak, Rachel H. McQueen, Jane C. Batcheller

wingsem@ualberta.ca

Student and Supervisors

Recycled materials are one solution for reducing environmental impacts in textile production. Regarding wool textiles, recycling can especially lower methane emissions from wool production. However, recycled materials can offer lower performance and result in a shorter lifespan, negatively impacting their overall eco-effectiveness. Meanwhile, research examining the physical properties of pre-consumer waste recycled wool fibres and fabrics is limited. This study examines the recycled pre-consumer waste and virgin wools in fibre, yarn, and fabric forms to investigate the durability and product handle following applicable standardised test methods. With a subjective fabric hand test, this study determines (i) the differences in physical properties between recycled and virgin wool products, and (ii) the durability and handle on predicting their potential lifespan and consumer acceptance. Yarns and fabrics with different wool contents were tested for their physical properties, such as yarn appearance, tensile and bursting strength, dimensional stability, and pilling performance, to determine the material's durability. A tactile sensory test was adopted to explore the consumer perception of the virgin and recycled wool fabric.

Hydrothermal aging of PBO fabric – Effect of liquid water/water vapor and temperature

Rajitha Botheju, Saiful Hoque, Patricia Dolez

botheju@ualberta.ca

PhD Student, PhD Student, Associate Professor

Firefighting is a high-risk occupation: firefighters get exposed to different types of hazardous categories: extreme heat, flame, cold weather, rough surfaces, etc. To help preserve their safety, they wear bunker suits made with fabrics composed of high-performance polymeric fibers. These fabrics display excellent performance when new; however, the high-performance polymers age over time as any other engineering polymer, which may affect their performance. Poly(p-phenylene-2,6-benzobisoxazole) (PBO) is the polymer that has the highest mechanical strength among all commercially available polymers. However, research has shown that PBO fabrics may be susceptible to hydrothermal aging when exposed to moisture and temperature.

The objective of this study is to understand the impact of the different hydrothermal conditions on the aging of a 100% PBO fabric. Samples were either immersed in water or subjected to 100% relative humidity (RH) to simulate the two phases of water relevant to firefighter bunker gear's hydrothermal aging conditions. The experiments were conducted at 21, 60, 80, and 90°C with exposure times between 10 and 50 days. Five replicates per condition were used to evaluate the sample residual mechanical strength following the ASTM D 5035 standard test method.

The temperature significantly affected the PBO fabric's residual strength after hydrothermal aging. On the other hand, water immersion and exposure to 100% RH led to similar results in terms of tensile strength. The results of this study shed new light on the hydrothermal aging behavior of PBO fibers in conditions relevant to service conditions.

Examining the odour-control efficacy of antimicrobial textile finishes

Jennifer Beaudette, Jelena Holovati, Jane Batcheller, and Rachel McQueen

jbeaudet@ualberta.ca

Jennifer Beaudette, Jane Batcheller, and Rachel McQueen are from the department of Human Ecology

Jelena Holovati is from the department of Laboratory Medicine and Pathology

The application of antimicrobial agents has gained popularity in the market due to consumer's attitudes toward hygiene and the increased emphasis on an active lifestyle. For example, antimicrobials have been applied to activewear to help combat odour development. Marketing for antibacterial and odour control clothing can include claims that it does not need to be laundered as frequently as clothing without these specialized treatments. This often translates to claims of the clothing being more sustainable because of the opportunity to reduce water and energy use with less frequent laundering. A range of compounds have been used as antimicrobial agents including triclosan, quaternary ammonium compounds (QACs), metals and metal salts, like silver or copper, zinc pyrithione, and the naturally derived chitosan. As the use of antimicrobial agents in the clothing and textile industry has grown, so have concerns around the potential risks associated with their widespread use. For example, triclosan has been added to the ZDHC Manufacturing Restricted Substances List due to its toxicity and ability to persist in the environment. The benefits and drawbacks of adding antibacterial agents to textiles needs to be examined. The proposed research will first seek to determine if consumers would modify their laundering behaviour of activewear when an antimicrobial treatment is applied. Subsequently, a wear trial will be conducted to measure the efficacy of different antimicrobial-treated athletic tops in reducing odour development. This will help inform whether antimicrobial treatments offer the purported benefits.

Monetary value of unpaid care in Canada: A comparison of valuation methods

Choong Kim

choong1@ualberta.ca

University of Alberta, Department of Human Ecology

Providing care to family members and friends remains a significant household activity in Canada, amounting to a total of 5.7 billion hours on care in 2018. Yet, this unpaid caregiving labour is often overlooked by policymakers and governments and the monetary value of unpaid care is rarely included in economic evaluation studies that inform policymakers' evidence-based guidance on allocating public funds across the economy. This study sought to reveal the tremendous contribution family caregivers make to the Canadian economy and to highlight selected inequalities within society by showing the differences in the contribution of caring activities between men and women, which are often hidden in public agendas and discussions. The findings of this study also present evidence that estimates of the monetary value of unpaid caregiving labour are different depending on what valuation method is used, even when the same sample of caregivers is used. This study argues that conceptual and methodological differences in valuation methods play help to explain differences in resulting estimates. The study concludes with recommendations about the conditions under which it is appropriate to apply which of the valuation methods.

Everyday Life Experiences of Chinese Immigrant Families with Young Children

Yanchi Mou

ymou@ualberta.ca

University of Alberta

This study addresses the gap in research regarding the daily life experiences of Chinese immigrant families with young children, focusing on the perspectives of multiple family members. While existing studies predominantly examine individual family members' experiences, there is a need for a broader exploration of these experiences from various viewpoints.

To contribute to a more comprehensive understanding, this study specifically investigates the challenges faced by Chinese immigrant families with young children, the resources and strategies utilized to manage these challenges, and the resulting effects. Employing a secondary analysis approach, data from individual and family interviews, photographs, and scrapbook entries were analyzed through thematic analysis within the Contextual Model of Family Stress framework.

Findings indicate that primary challenges include child-rearing and intra-family conflicts, alongside financial strains and language barriers/lack of local work experiences/employment difficulties for newcomers. Families employ a variety of resources, including internal support networks, community programs, and governmental assistance, to address these challenges. These challenges and resources significantly impact emotional well-being, family relationships, daily routines, and social integration.

In conclusion, while internal resources such as familial support are crucial, external support from community services and government agencies also play a critical role. This study emphasizes the importance of tailored support services for immigrant families, taking into account the diverse challenges experienced based on length of residency. Community services should be attentive to these differences and provide targeted support accordingly to facilitate successful integration and well-being.

Poster presentations

Abstracts are presented in order of poster viewing.

Machine Learning to Optimize Extrusion Parameters for Novel Plant-Protein Sources

Amanda Buchko, Shu-Bo Yang, Lingyun Chen, Jay Han

abuchko@ualberta.ca

Pea and Faba proteins are a more sustainable viable alternative to replace traditional texturized vegetable protein (TVP) sources to supplement or replace animal meats in products like burger patties, meatballs, and sausages. However, novel sources of TVP require substantial investment of capital, time, expertise and resources to develop on the part of industry. This is where the use of machine learning presents an opportunity to assist in the optimization of extrusion parameters based on desired functional outcomes. Select extrusion parameters were adjusted at 60% and 70% for protein content, for temperature at 160°C, 170°C, and 180°C, and for moisture content at 45%, 50% and 55%. A machine learning model in the form of a decision tree was built to predict these parameters and integrated into a linear programming optimization model to determine optimal combinations. Results suggest protein content and temperature have a larger effect on ER, WHC and OHC than moisture. Models were able to find the best fit from large variations in moisture with optimal TVP inputs. Models built with a specific protein sources had lower error rates (ER=7.6% vs 8.2%, WHC=13.7% vs 14.5%, OHC=4.7% vs 5.3%), but different pea protein sources can fit both models built with either one or two pea sources. Faba protein source did not always fit the model (error rates higher than 15% cut off), therefore model development can not span over different protein sources. This work can benefit the food industry by using machine learning models to decrease R&D input costs, materials, and time when developing a texturized vegetable protein product.

Quantitative proteomics analysis reveals the prevention of chemotherapy induced catabolic changes by omega-3 fatty acids in a preclinical model of colorectal cancer

Peter Isesele, Richard Fahlman and Vera Mazurak

isesele@ualberta.ca

Department of Agricultural Food and Nutritional Science, University of Alberta, Edmonton, Alberta, Canada

Cancer and chemotherapy affect metabolism and cause muscle wasting, linked to poor prognosis. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are known to benefit muscles during cancer therapy, but their mechanisms remain unclear. This study explored the impact of dietary EPA+DHA after standard chemotherapy (FOLFIRI) on muscle using quantitative proteomics analysis. Female Fischer 344 rats with Ward colon tumors were fed a diet resembling a westernized diet. After two weeks of tumor growth, they received chemotherapy. Rats were then randomly assigned to continue their regular diet (CHEMO) or switch to a diet with EPA+DHA supplementation (CHEMO + Fish oil). Rats without tumors served as a healthy group (REF). Protein from gastrocnemius muscle was analyzed using LC-MS/MS before chemotherapy (TUM) and 8 days after. Differential expression proteins (DEP) were identified with Fold-change $\geqslant$ 1.5 and P-value <0.05, analyzed for KEGG pathways and Gene Ontology (GO) enrichment. In CHEMO vs. REF, 329 DEP were found, and was reduced to 44 with Fish oil. Significant pathways induced by CHEMO included reactive oxygen species, proteosomes, PPAR signaling, and lipid transport. CHEMO + Fish oil showed pathways in oxidative phosphorylation, 2-Oxocarboxylic acid metabolism, and citric acid cycle. GO analysis indicated CHEMO induced catalytic activities and cellular processes, reduced by 80% with Fish oil, suggesting enhanced energy utilization. Proteomics analysis provides insights into the molecular mechanisms by which dietary EPA+DHA prevents chemotherapy-induced catabolic changes in the muscle and reveals the potential to mitigate the deleterious effects of chemotherapy on the muscle that confer poor prognosis.

Effect of Breeding Selection on Root System Architecture and Nitrogen Use Efficiency of Prairie Wheat and Barley Varieties

Suman Bagale, Linda Gorim

bagale@ualberta.ca

Department of Agricultural, Food and Nutritional science, University of Alberta

Plant roots are crucial for anchorage, nutrient, and moisture uptake, and coping with stress. However, research on plant roots is challenging, labor intensive and expensive because they are below ground. Breeding efforts have majorly focused on the above-ground parts, neglecting the roots. This greenhouse study aims to explore the Root System Architecture (RSA) of old and current prairie wheat and barley varieties, along with their Nitrogen Use Efficiency (NUE). To investigate RSA, plants will be grown rhizoboxes. Real time root growth will be monitored and observed using RhizoVision® and Time-Spirit®. Images will be analyzed to obtain root length, root diameter, total root surface area, number of root tips, branching angle, root volume, and root length density. At BBCH-65 stage destructive sampling of the roots will be done to determine root biomass and RSA using WinRhizo®. To determine NUE, urea and superU will be banded at different depths (2.5 cm and 3.5 cm) and nutrient-sensing of N fertilizer by roots will be done using the linkage analysis feature offered by WinRhizo®. NUE will be determined by quantifying the total biomass per unit of nitrogen applied. Comparative data analysis will reveal how breeding selection has affected RSA and NUE in 30-40-year-old prairie wheat and barley varieties compared to modern ones.

Enhancing carbon sequestration and microbial activity through native plant restoration in Saskatchewan grasslands

Dauren Kaliaskar and Cameron N. Carlyle

kaliaska@ualberta.ca

Department of Agricultural, Food and Nutritional Science

Grasslands are endangered ecosystems because of conversion to cropland, which contributes to climate change through increased greenhouse gas emissions and reductions in biodiversity. Restoration of cropland back to grassland can help restore biodiversity through the planting of native vegetation and reduce greenhouse gases through the establishment of perennial plants. The research I am developing will examine the effects of grassland restoration on forage production, soil carbon storage and indicators of soil health related to nutrient cycling and soil microbial communities. This will be done using two approaches. First, I will use a chronosequence to examine the long-term effects of restoration on plants and soils and will take measurements at locations where the restoration history is well known. These sites range in age from a few years to decades, which will enable estimation of carbon sequestration and development of the soil microbial community over time. In a second approach, I will examine short-term (3 years) change in vegetation, soil properties and microbial communities at newly established restoration sites where I can measure baseline conditions prior to restoration. This comprehensive analysis will elucidate the relationship between reintroduced plant species, microbial activity, and the carbon sequestration capability of restored grasslands.

This research will aid producers in optimizing land use for their production purposes by supporting the conversion of marginal cropland back to native vegetation, help the agricultural sector reduce its greenhouse gas footprint, and contribute to understanding of succession of microbial communities and their function in grasslands.

Influence of fuel data assumptions on wildfire risk assessment of the built environment

Air Forbes, Jen Beverly

amforbes@ualberta.ca

Department of Renewable Resources

Background

Land cover information is routinely used to represent fuel conditions in wildfire hazard, risk and exposure assessments. Readily available data options that vary in resolution, extent, cost and other aspects of data quality have become increasingly accessible in recent years.

Aim

This study investigates the sensitivity of community-scale wildfire exposure assessments to identifying hazardous fuel from different land cover information sources.

Methods

Ten versions of a community wildfire exposure assessment were conducted for each of five case study locations in Alberta, Canada by varying the input data source. Proportional distribution and spatial agreement of hazardous fuel and classified exposure are compared across datasets and communities.

Key Results

Variation in assessment results was found consistently in each community, but the nature of this variation differed by communities. Land cover classification definitions were an important factor that led to inconsistencies in assessment results.

Conclusions

Results suggest that readily available land cover information may not be appropriate for universal use across large study areas at a community scale. The ideal dataset may differ between communities when unique context and local knowledge of the assessment area is incorporated.

Implications

Results may inform fuel data selection for various wildfire applications.

Polarized Light Pollution and its Effect on Aquatic Insects.

Julia van der Merwe

jvander1@ualberta.ca

John H. Acorn

Polarized light pollution from anthropogenic sources creates surface confusion for aquatic insects. In nature, water is the strongest producer of polarized light, reflecting polarized light at 80% reflectance. Anthropogenic surfaces can reflect polarized light at 100% reflectance. As a result, to aquatic insects these surfaces can appear more like water than actual water. Polarized anthropogenic surfaces include windows, automobile hoods, trunks and roofs, tonneau covers, new asphalt, plastics, painted and shiny metals, and solar panels. Aquatic insects, such as dytiscids, trichopterans, ephemeropterans, odonates, tabanids, and corixids, use polarized light to locate aquatic habitats, including sites for mating and oviposition. Surface confusion can result in mortality of both eggs and adult insects. Aquatic insect dispersal occurs during the warm seasons, when anthropogenic surface temperatures increase with exposure to sunlight. The lethal surface temperature for aquatic insects is 45°C or greater. During the month of September, temperatures of polarized surfaces were recorded using a Fluke 62 Mini Infrared Thermometer, in the city of Edmonton, Alberta. Polarization was assessed qualitatively with polarized sunglasses and a Nikon DSLR camera system equipped with a linear polarizing filter, with images analysed in Photoshop CS. Polarized anthropogenic surfaces reached temperatures of 45°C and greater. These findings suggest that cities are a potential population sink for aquatic insects. Further work will focus on estimating the potential for insect population declines with growing urbanization and increasing temperatures as a result of climate change.

How do Phenotypes of Seed Orchard (Improved) vs Wild (Unimproved) Seedlings of Pinus contorta (Lodgepole Pine) differ under Commercial Greenhouse Condition?

Sarun Khadka and Barb R. Thomas

sarun1@ualberta.ca

Department of Renewable Resources

Improved (orchard origin) is expected to grow taller than unimproved (wild seed) as this is the trait of selection in most tree improvement programs in Alberta. However, the forest industry in Alberta typically provides the same criteria or 'specs' for retaining seedlings at the time of lifting in the greenhouse (height: 7-23cm, root collar diameter (RCD) > 2.2mm). For this study, eight lodgepole pine seedlots (three improved and four unimproved) were used from the commercial greenhouse. At that time of lifting, the seedlings, which does not meet the lifting criteria, were discarded, both discarded and retained seedlings were collected at the greenhouse and brought back to the University of Alberta for processing to acquire data on height, RCD, aboveground biomass (AGB), leaf area, and belowground biomass (BGB). For culls, 100 seedlings per seedlot randomly selected from the total number of culled seedlings and for specs, 30 seedlings per each seedlot. The objectives of the study was to compare height and RCD performance between 1) improved vs unimproved seedlots; and 2) culled vs specs seedlings. The Welch's t-test and ANOVA results showed that all four improved seedlings are taller than unimproved seedlings ($p<0.001$), two out of four improved culled seedlings are taller than specs ($p<0.001$), and three out of four unimproved culled seedlings are taller than specs ($p<0.001$). However, specs trees of unimproved seedlots had a significantly larger RCD than specs of improved ($p<0.05$) whereas the culled seedlings of improved has much larger RCD than culls of unimproved ($p<0.05$).

Linking Ring Width to Mast Years in Yukon White Spruce

Carson Lopatka, Barb Thomas, Stan Boutin

clopatka@ualberta.ca

University of Alberta

Mast seeding is the synchronous production of a large seed crop by a plant population which takes place in irregular or nonpatterned temporal intervals. Fluctuations in reproductive effort in plants has largely been attributed to both resource availability and non-cyclical environmental cues. The alteration of growing season temperatures and resource availability by climate change leaves understanding masting at the forefront of forest science research. Here, we assess masting by white spruce (Picea glauca) focusing on the resource allocation trade-off between seed production and radial growth, and the frequency of mast years amidst the ongoing effects of climate change. Resistograph profiles (n=173) and a subset of tree core samples (n=39) were collected in the southwestern region of the Yukon Territory, Canada in June and July of 2023. Annual radial growth measurements were then compared to mast year observations that date back to 1988. To predict mast years prior to records, historical Environment Canada Climate data for maximum temperature and degree-days (>5°C) in July were used to model expected total cone production per tree in the study area from 1946 to 1988. Preliminary results have indicated a signal of smaller tree ring width in mast years and no increase in the frequency of mast years in recent times.

Key Words: mast seeding, radial growth, white spruce, Yukon.

Aerobic exercise before and during neoadjuvant chemotherapy helps maintain several QoL indicators in women with breast cancer in the DHA WIN RCT

Claire Douglas1, Marnie Newell1, Susan Goruk1, Kerry S. Courneya2, Sunita Ghosh3,4, Anil A. Joy3, Catherine J. Field1

cgdougla@ualberta.ca

1 Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada

2 Faculty of Kinesiology, Sport and Recreation, University of Alberta, Edmonton, AB, Canada

3 Department of Oncology, University of Alberta, Edmonton, AB, Canada

4 Department of Public Health Sciences, Henry Ford Hospital, Detroit, MI, USA

Chemotherapy has been associated with several side effects that undermine the quality of life (QoL) of individuals with cancer. Both exercise and supplementation of omega-3 polyunsaturated fatty acids have been associated with improved QoL during chemotherapy. The current study analyzes secondary outcomes from the phase II randomized controlled trial evaluating docosahexaenoic acid (DHA) supplementation (4.4 g/day) on tumour growth and metabolism in women with breast cancer undergoing neoadjuvant chemotherapy.

Many QoL indicators, including most subscales of the Functional Assessment of Cancer Therapy (FACT) questionnaires, decreased over time in both the DHA (n=22) and control (n=25) groups (p-time $\leqslant$ 0.03). DHA did not significantly mitigate the change in QoL over time.

Participants that met the WHO's aerobic exercise recommendation at baseline experienced a smaller decline in their FACT-general (FACT-G) total score, a greater decline in their Perceived Stress Scale and State-Trait Anxiety Inventory scores, and a greater increase in their emotional well-being score over time (p-interactions $\leqslant$ 0.05). Similarly, participants that met the WHO's aerobic exercise recommendation at the end of treatment experienced a smaller decline over time in their FACT-G total score and functional well-being (p-interactions $\leqslant$ 0.01). These findings suggest that aerobic exercise before and during treatment mitigates the negative effect of chemotherapy on various QoL indicators in patients with breast cancer.

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Effect of grazing management on vegetation diversity and composition

Caroline Wade1, Amgaa Batbaatar1, Edward Bork1, Scott Chang1, Angela Bedard-Haughn2, Preston Sorenson2, Cameron Carlyle1

cwade1@ualberta.ca

1University of Alberta; 2University of Saskatchewan

Grasslands store carbon in their soil helping to offset climate change, while simultaneously providing forage for livestock. Livestock grazing alters grassland plant communities, which are the main drivers of carbon sequestration. Over large grassland areas, the effects of cattle grazing are not homogenous, which creates spatial variation in plant communities. In order to identify and understand the consequences of livestock on net soil carbon storage it is critical to measure the variation of plant communities resulting from different livestock management systems. This study measured plant species cover in native and tame pasture types under adaptive multi-paddock grazing (AMP, cattle moved every 2 weeks or less), rotational (cattle moved between 2 weeks and 3 months), and continuous (season long) grazing management. We found that native pastures had significantly higher plant diversity than tame pastures, however grazing management had no significant effect on plant diversity. However, beta-diversity (measured as community dissimilarity) was greater among AMP ranches. Further sampling and analysis may allow us to better explain the relationship between grazing and vegetation diversity. Long-term, we will examine the relationship between plant communities, grazing practices, and soil carbon stocks to enhance quantification of soil carbon and identify management practices that increase soil carbon.

Bovine-derived Lactobacillus mixture as a strategy to minimize beef calf stress at weaning

Vanesa Ramírez1, Sergio Lasso1, María C Méndez1, Leluo Guan2, María C Ceballos3, Tim A McAllister4, Karen Schwartzkopf-Genswein4, Nilusha Malmuthuge4, Gleise M. da Silva1

vramirez@ualberta.ca

1. University of Alberta, Edmonton, AB.

2. University of British Columbia, Vancouver, BC

3. University of Calgary, Calgary, AB.

4. Agriculture and Agri-Food Canada, Lethbridge, AB.

Weaning, a management practice commonly experienced by beef cattle, is acknowledged as a significant source of stress, potentially compromising calf health and productivity. Bacteria inoculation is a strategy intended to modulate the gut microbiota, with some bacteria being studied for their potential to promote psychobiotic effects on the host through the gut-brain axis. However, research on testing microbial inoculation's ability to reduce stress in beef cattle is limited. The objective of this study was to evaluate the effects of inoculating beef calves with a bovine-derived mixture of Lactobacillus spp (L. reuteri, L. delbrueckii, L. mucosae, and L. agilis) during early life (~ 2 mo old) to further mitigate stress at weaning. It is expected that a bovine-derived blend of Lactobacillus inoculated during early life will allow microbial establishment in the gut of calves. A total of 32 crossbred beef calves (16 per treatment) were randomly assigned to receive a Lactobacillus cocktail (10^9 CFU in 5 ml saline solution) or placebo (saline solution only). The experiment consisted of a first dose of inoculation administered orally at spring processing (day 0) followed by a second dose 3 days after (day 3). Blood, fecal samples, and reactivity traits were collected at day 0, 3, weaning, and 3 days post-weaning. Pedometers were used to measure activity behavior in the days following weaning. We hypothesized that administering a blend of bovine-derived Lactobacillus would increase the likelihood of these probiotics persisting in the calf's digestive tract. Consequently, this could potentially reduce stress at weaning.

The role of EPA and DHA to modify inflammation and adipokines in chemotherapy induced adipose tissue wasting in a pre-clinical model of colorectal cancer

Stanley Woo, Abha Dunichand-Hoedl, Irma Magaly Rivas-Serna, Peter Isesele, Md Monirujjaman, Stephane Servais, Catherine J. Field, and Vera Mazurak.

skwoo@ualberta.ca

Department of Agricultural Food and Nutritional Science, University of Alberta, Edmonton,

AB, T6G 2P5, Canada.

Faculté de Médecine, Inserm UMR1069 Nutrition Croissance et Cancer, Université de Tours, Tours Cedex, 37020, France.

Colorectal cancer (CRC) patients undergoing chemotherapy often lose both subcutaneous adipose tissue (SAT) and visceral adipose tissue (VAT); however, the loss of SAT is more predictive of mortality than VAT. Dietary eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) may ameliorate these losses. This study aims to assess pro-inflammatory cytokines, adipokines, and lipogenic/lipolytic proteins in VAT and SAT following chemotherapy in a pre-clinical model of CRC, and to determine if EPA+DHA modifies these alterations.

Fischer 344 rats were implanted with colon tumour two weeks before receiving chemotherapy. Rats either consumed a semi-purified diet (control) resembling a western diet, or an EPA+DHA enriched diet (purified fish oil; 3% w/w). VAT and SAT were collected 8 days following chemotherapy. Control diet tumour bearing rats with no chemotherapy served as the control. A multiplex assay measured adiponectin, leptin, IFN-γ, IL-1β, IL-6, CXCL1, TNF-α, and IL-10. ATP citrate lyase (ACLY), hormone sensitive lipase (HSL), and adipose triglyceride lipase (ATGL) were measured with Western blot.

HSL levels in VAT were twice that of the control group ($p<0.01$). Both VAT and SAT had higher IL-1β (VAT +100%, SAT +70%) and CXCL1 (VAT +2400%, SAT +650%) compared to the control group ($p<0.05$). SAT showed higher IL-6 (+400%, $p<0.05$), whereas VAT had elevated TNF-α (+45%, $p<0.005$). EPA+DHA lowered TNF-α concentrations to control group levels ($p<0.05$). ACLY, HSL, and ATGL were not significantly impacted by EPA+DHA. In conclusion, VAT and SAT respond differently to chemotherapy, increased inflammation and lipolysis may deplete adipose tissue, and dietary strategies may benefit cancer patients.

The effect of humic-based soil amendment on nodulation and plant growth in forage legumes

Oshadhi Athukorala Arachchige, Malinda Thilakarathna

oathukor@ualberta.ca

Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB T6G 2P5, Canada

The use of synthetic chemical inputs in modern agriculture has significantly increased crop production but has created negative effects on environment. Incorporation of nitrogen fixing legumes and organic soil amendments like humic-based products (HPs) can reduce dependency on agrochemicals, promoting long-term sustainability and productivity. Humic substances (HSs) play a vital role as plant biostimulants, enhancing plant growth and yield production. However, the efficacy of HPs depends on the humic acid concentration, emphasizing the need to find the optimal application concentration. Legume plants fix atmospheric nitrogen through legume-rhizobia symbiotic nitrogen fixation (SNF), reducing nitrogen fertilizer requirements. Suboptimal nodulation can decrease nitrogen fixation inputs, so finding effective ways to optimize nodulation is essential for enhancing SNF inputs. While research on the effect of humic acids (HA) on legumes exists, Humalite, a rich source of HA found in southern Alberta, Canada, remains understudied. This proposed study will investigate the effects of different concentrations of liquid Humalite (ranging from 0.025% to 0.4% v/v) on alfalfa and red clover nodulation, root traits, plant growth, and nitrogen fixation compared to the untreated control. The experiments will be conducted under controlled environmental conditions using a hydroponic system. Plants will be sampled after eight weeks of growth, and data will be collected on nodule number, nodule dry weight, root length, root surface area, root volume, plant dry weight, shoot nitrogen assimilation, and SNF. Systematic analysis of these parameters will provide insights into the potential benefits of Humalite application on legume growth and nitrogen fixation.

Exploring Hemp for Regenerated Cellulosic Fiber Manufacturing through Lyocell Process: A Sustainable Alternative for Agriculture and Textile Industries.

Md. Abu Sayed1, Lelia Lawson1,2, K M Abdun Noor1, Dagem Zekaryas Haddis3, Jane Batcheller1, David C. Bressler3, Patricia I. Dolez1

mdabu2@ualberta.ca

1 Department of Human Ecology, University of Alberta, Edmonton, AB T6G 2N1, Canada

2 Davey Textile Solutions, Edmonton, AB T5P 4Y7, Canada

3 Department of Agriculture, Food, and Nutrition Science, University of Alberta, Edmonton, AB T6G 2P5, Canada

This research investigates hemp fiber as an eco-friendly solution to meet the growing demand for sustainability in agriculture and textile manufacturing. It takes advantage of hemp's low environmental impact and suitability for cultivation in Canada. The goal is to address environmental challenges associated with the rising consumption of textiles and create economic opportunities for farmers. The study assesses the potential of different hemp feedstocks for producing regenerated cellulosic fiber through the lyocell manufacturing process. Key characteristics in terms of moisture, ash, extractives, metal, cellulose, hemicellulose, and lignin content are measured on decorticated and milled hemp bast fiber samples. Initial findings indicate that the moisture content aligns with lyocell process targets for dissolving pulp. On the other hand, the extractives, ash, and metal contents are higher than the recommended levels for lyocell-dissolving pulp. However, these compounds can be extracted by chelation as part of the traditional dissolving pulp preparation process. The cellulose, hemicellulose, and lignin contents fall within the expected ranges for hemp fiber based on the literature. Washing and bleaching will allow the lowering of the ratios of hemicellulose and lignin as part of the dissolving pulp preparation to achieve optimal performance in the regenerated cellulose fiber produced. This research underscores hemp's potential as a sustainable alternative for eco-friendly cellulosic fibers in textile manufacturing, benefiting both farmers and the environment. The next step will involve preparing dissolving pulp from the various hemp feedstocks and extruding them to create regenerated cellulose filaments.

From Waste to Wealth: Recycling Cotton Garments for Sustainable Textile Fibre Manufacturing

K M Abdun Noor1, Lelia Lawson1,2, Md Abu Sayed1, Dagem Zekaryas Haddis3, Jane Batcheller1, David C. Bressler3, Patricia I. Dolez1

kmabdun@ualberta.ca

1 Department of Human Ecology, University of Alberta, Edmonton, AB T6G 2N1, Canada

2 Davey Textile Solutions, Edmonton, AB T5P 4Y7, Canada

3 Department of Agriculture, Food, and Nutrition Science, University of Alberta, Edmonton, AB T6G 2P5, Canada

Despite the persistent global dependency on textiles, the environmental impact of textile manufacturing remains a pressing concern. This research addresses this issue by exploring the recycling of used cotton garments to produce regenerated cellulose fibres. The study aims to divert textile waste from landfills, establishing a local source of feedstock for Made-in-Canada regenerated cellulose fibres and reducing the environmental footprint associated with the use of cotton fibres. As a first step, the research measured cotton waste characteristics - moisture, ash, metal, extractives, cellulose, hemicellulose, and lignin content, using standardized test methods to determine the suitability as a feedstock for the lyocell regenerated cellulose process. Results for a used olive-coloured cotton T-shirt indicated the presence of inorganic contaminants, including metals, in concentrations above the recommended levels. These contaminants can be removed as part of the traditional dissolving pulp preparation process, ensuring the production of high-quality regenerated cellulose fibres. The next step will involve manufacturing cellulose pulp from this cotton waste and using it to produce lyocell fibres. The study will also explore the feasibility of utilizing flame-resistant cotton and cotton blended garments, broadening the scope of the source of feedstock for the lyocell process. Aligned with circular economy principles, this comprehensive approach offers an eco-friendly alternative to synthetic and viscose fibres, contributing to a more sustainable textile industry. The findings of this research will not only benefit researchers, industry professionals, and policymakers but also pave the way for innovative solutions and practices that foster environmental stewardship within the textile manufacturing landscape.

Memory Care Environments: Constraints and Affordance of Home in Material Culture

Orsolya Welch, Megan Strickfaden

ojakab@ualberta.ca

Canterbury Foundation & others (to be provided later)

Keywords: human ecology, nursing home, physical elements, reflexive process, spatial design, spatial/object centric, web content analysis

It is often challenging to navigate the complexities of care that come with ageing, considering the evolving physical, cognitive, and social needs for seniors in assisted congregate living. To accommodate these age-related transitions, including compromised memory, nursing and residential care facilities have adopted different ways of caring in creating distinct home-like environments to distinguish various levels of care, including memory care.

To better understand this interplay between the design of care environments and memory care residents, a more holistic human ecological lens was used to explore the material culture of 5 specialized nursing homes in Canada. Using a detailed analysis framework based on the theory of affordances, a spatial/object centric approach helped investigate and analyze well-known elements, principles, and the physical/construction properties of interior and spatial designs. Through web content analysis, hundreds of photographs, drawings, and textual information belonging to select nursing homes posted on websites and on social media were collected and assessed.

The results of this study revealed how building elements, objects, and spaces can be curated within memory care environments to provide multisensory cues that support desired behaviors. This poster highlights the research tools used to analyze and understand these interrelated aspects, which contribute to the fields of material culture, design studies, and have the potential to enhance the lives of people with compromised memory.

Sod-Seeding Perennial Legumes into Beef Cattle Pastures in Central Alberta

Georga Boffen Yordanov, Bismark Asante-Basu, Erick Santos, Cameron Carlyle, Edward Bork

yordanov@ualberta.ca

AFNS Department, Faculty of ALES

Agricultural outputs make up a significant portion of global greenhouse gas emissions. An increase in productivity of already-established pastures while also decreasing greenhouse gas emissions from these pastures is possible when sod-seeding perennial legumes into established forage stands. In this project, we are examining the recruitment dynamics of legumes sod-seeded into pastures as a method of rejuvenation (and the following changes in forage mass, nutritive value, and quantity post-seeding) and investigating legume contributions to greenhouse gas mitigation.

Our study examines three sites in central Alberta that sod-seeded perennial legumes into existing pastureland in mid-to-late June 2023. Each site has eight plots in a randomised complete block design (four control plots and four sod-seeded plots), with each plot at least 5 m wide by 100 m long and containing four subplots where subsampling occurs. Per subplot, there were two shallow soil cores taken (at 0-30 cm depth, and will be used to quantify soil organic matter, pH, electrical conductivity, and total carbon and nitrogen), grazed and non-grazed biomass has been clipped (will be tested for neutral detergent fibre, acid detergent fibre, and protein, will be repeating clipping in 2024 as well), and greenhouse gas emissions sampled (thrice in 2023 and monthly in 2024 growing period, measuring emitted carbon dioxide, methane, and nitrous oxide). This study will produce quantitative information on the effectiveness of sod-seeding for pasture rejuvenation, a cost-benefit analysis of the agronomic benefits of sod-seeding, and insight into how legume sod-seeding alters ecosystem services associated with climate change mitigation.

Optimizing Collagen Peptide Extraction from Spent Chicken: Revealing Anti-Aging Potentials

Yuanyuan Lou

lou1@ualberta.ca

University of Alberta

The skin, being the largest organ, undergoes aging due to various factors such as UV radiation and inflammation. Collagen, a vital component of the extracellular matrix, has been extensively studied for improving skin health. Spent chicken is a rich source of collagen, however often overlooked and considered as food waste in the industry, presenting an opportunity for sustainable extraction practices. This study aims to optimize the extraction process of collagen from spent chicken and enhance the anti-aging bioactivity of collagen-generated peptides.

Through enzymatic hydrolysis using papain, the collagen peptides achieved a degree of hydrolysis exceeding 20%. Furthermore, employing sonication at 40 amplitude for 20 minutes yielded a 0.4% increase in the degree of hydrolysis of the extracted collagen peptides. Notably, these collagen peptides demonstrated efficacy in shielding HaCaT cells from both UVA and UVB exposure.

The proposed research offers sustainable solutions to utilize poultry by-products and mitigates environmental concerns associated with their disposal. This research also contributes to the development of skincare and pharmaceutical products, aligning with global efforts towards environmental sustainability and human health improvement.

Effects of grazing management on soil carbon storage, size fractions, microbial communities and necromass in northern temperate pastures

Sangita Chowdhury, Edward W. Bork, Cameron N. Carlyle

sangita3@ualberta.ca

Department of Agricultural, Food and Nutritional Science, University of Alberta, 410 Agriculture/Forestry Centre, Edmonton, Alberta T6G 2H1, Canada

Grasslands cover 25% of the terrestrial surface globally, 40% of which is used for grazing livestock and hold 30% of global soil carbon. Different livestock grazing management practices can alter the amount of carbon held in grassland soils, potentially helping to reduce the effects of climate change. However, not all pools of soil carbon are equally stable and therefore contribute differently to climate offset. Identifying grazing management practices, and the underlying biological processes, that create stable soil carbon is important for long-term reductions in greenhouse gases. Generally, minerally associated organic matter (MAOM) is considered stable, while particulate organic matter (POM) is considered to be labile. While it is generally understood that carbon moves from plants, to microorganisms, to the soil the processes regulating this are not clear. One potentially important, but understudied, component of this process is necromass, the material from dead fungi and bacteria in the soil which binds to MAOM. I will examine the relationship between different grazing management practices, soil microbial communities, necromass and the amount of carbon held in MAOM. This will be done by collecting upper soil layers from grasslands and pastures with known grazing management. The amount of MAOM will be measured using size fractionation and necromass will be measured using amino sugar biomarkers using HPLC. This study will be helpful to better understand how grasslands can be managed to promote long-term, stable soil C storage.

Agronomic Response of Canola, Oats, and Wheat to Lime Amendments under black and gray soils in Alberta, Canada

Jedida Chirchir

chirchir@ualberta.ca

AFNS, University of Alberta

A field experiment was conducted in black soils in the Crop Diversification Center-North (CDC) and gray soils in Breton plots in Alberta. The study aimed to examine the agronomic response of canola, oats, and wheat to five lime amendments (T0: control, T1: agricultural lime, T2: cement kiln dust, T3: sugar beet lime, T4: hydrated lime). The experiments were established in May 2023. Plant height, above-ground dry biomass, and grain yield were measured at different stages of growth. In Breton plots, lime application had no positive effect on canola plant height compared to the control, while in CDC plots, lime application positively influenced plant height, with the highest values observed with T4 treatment. Wheat and oat height were unaffected by lime application although significantly taller in CDC than Breton. A reduction in plant biomass was observed in oats, wheat, and canola for T1 and T2 compared with T0. Negative responses to lime application were observed for canola yield in Breton. However, lime application increased canola yields in CDC. Inconsistent yield trends were observed with liming oats; however, a significant increase of 25 % was observed in T1 treatments when compared with T0 in Breton. Yields of wheat increased with liming, except for T3 in Breton. The preliminary findings show that liming did not significantly improve crop yields. Long-term investigation is required to understand crop-specific responses and improve recommendations across different soil types.

Improving management tools for low-density mountain pine beetle populations in novel habitats: investigating anti-attraction properties of fungal volatile compounds

Leah Crandall, Rashaduz Zaman, Nadir Erbilgin

lccranda@ualberta.ca

University of Alberta

Mountain pine beetles (MPB) overcome host tree defenses with the aid of symbiotic ophiostomatoid fungi, most commonly Grosmannia clavigera and Ophiostoma montium. During beetle colonization, antagonistic, saprophytic fungi such as Aspergillus and Trichoderma sp. can also colonize attacked trees. These fungi are commonly found in MPB galleries and are known to compete with MPB and their symbiotic fungi, thereby impacting beetle survival and reproduction. Recent work by Zaman et al. (2023) found that MPB are strongly attracted to fungal volatile organic compounds (FVOCs) emitted by symbiotic fungi. However, little attention has been given to the FVOCs emitted by antagonistic fungal species. Given that MPB attraction is known to be influenced by FVOCs emitted by symbiotic fungi, it is plausible that a similar phenomenon may occur with FVOCs from antagonistic species. Therefore, we will be investigating whether FVOCs emitted from antagonistic fungi may play a role in the inhibition of MPB attraction. We will characterize the volatile profiles of Aspergillus and Trichoderma species to identify possible anti-attractant compounds. We will then conduct choice assays in order to determine the impact of those individual FVOCs on MPB attraction. In the presence of antagonistic fungi, we expect to observe reduced MPB feeding and attraction to their symbiont FVOCs. Once we identify individual compounds with anti-attraction properties, we will conduct field experiments using beetle pheromones. This work will allow us to better understand interactions between MPB and FVOCs during host selection and could expand MPB monitoring tools.

Phytoremediation of hydrocarbons in peatlands

Mahdiyeh Safaripour and M Anne Naeth

safaripo@ualberta.ca

University of Alberta

Peatlands, which are important ecosystems that provide many diverse ecological services, face growing threats from human activities. One of these threats is hydrocarbons accidentally released from pipelines that can pollute soil and shallow ground water. Thus, removal of these compounds from the environment is vital. Remediation strategies are often destructive, prompting exploration of alternative, sustainable technologies such as phytoremediation. My research focuses on evaluating the phytoremediation potential of seven native plant species: Carex aquatilis (water sedge), Carex utriculata (beaked sedge), Carex rostrata (retrorse sedge), Scirpus microcarpus (panicled bulrush), Scirpus validus (softstem bulrush), Glyceria grandis (tall manna grass) and Typha latifolia (cattail). The greenhouse investigation evaluated the effectiveness of hydrocarbon remediation of soil and impacts of hydrocarbons on plant development under saturated and field capacity conditions. A comprehensive assessment of plant health, biomass, and soil hydrocarbon concentrations were evaluated over 60 days. Initial results indicate that plant growth and hydrocarbon removal capacities vary considerably among plant species and water concentrations. This study contributes valuable insights into sustainable remediation techniques for peatland ecosystems, emphasizing the role of native plant species in mitigating hydrocarbon contamination.

Interpolated climate grids developed with deep neural networks for Africa

Sarah Namiiro

namiiro@ualberta.ca

Andreas Hamann

This study is compiling an extensive weather station data base for Africa, and creating interpolated climate grids with deep neural networks. Climate grids are important to provide complete spatial coverages of large geographical areas. The deep neural network is supported by the use of covariate information to increase robustness in the prediction method. The grids produced will form the basis of a software package ClimateAF (e.g Climate NA, Wang et. al, 2016) to provide easy access to 48 monthly climate variables (Tmin, Tmax, Tave, Prec), and 36 bioclimatic variables (such as dryness indices) from 1901 to present and for CMIP6 future projections. Overall these products bridge a gap by availing high-resolution, easily accessible and reliable climate data for Africa that is important for researchers, decision-makers, and resource managers.

Thank you for attending the ALES Graduate Research Symposium 2024!