20th Annual
Capitol Graduate Research Summit

March 22, 2023

Kansas State University

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AMERICANS EXPRESS BLIND OPTIMISM FOR OVERCOMING CLIMATE CHANGE

Nicholas P. Gallivan, *Christopher J. Harley, Laura, A. Brannon*
Department of Psychological Sciences, Kansas State University

The growing severity of climate change necessitates further examination into peoples' beliefs and behaviors related to overcoming it. Differences in Americans' views of climate change are well documented, but limited research has examined the extent to which Americans are optimistic about overcoming climate change and how that optimism relates to other climate change-related beliefs. US-based Amazon Mechanical Turk workers (n=180; 39(12) years, 79% White, 53% Democrat) completed an online survey that measured various climate change-related attitudes and behaviors. Participants recorded being optimistic climate change can be overcome [$M(SD)$=4.87(1.56) of 7]. While *Support for Mitigative Action* was positively correlated with *Likelihood of Voting for Climate-Concerned Candidates* and *Perceptions of Government Effectiveness*, it was not correlated with *Optimism for Overcoming Climate Change*. However, *Climate Optimism* was positively correlated with *Government Effectiveness*, but not with either of the solution-related variables (*Mitigation Support* and *Voting Likelihood*). Additionally, while no relationship between *Climate Optimism* and *Political Party* surfaced, *Climate Optimism* was positively related to *Belief in American Exceptionalism*. Americans across the political spectrum are optimistic we can overcome climate change, but that optimism is not related to support for the most impactful, top-down solutions for overcoming climate change (i.e., civic and legislative action). Thus, a sense of blind optimism for overcoming climate change may be present, where Americans are optimistic climate change can be overcome, but how that will happen remains unclear. Subsequent research is seeking to confirm these results and to continue exploring potential sources of this blind optimism.

GRAIN SORGHUM AS A SUSTAINABLE INGREDIENT IN AQUATIC FEED – GRINDING AND PROCESSING ENERGY STUDIES

Tucker Graff[1], D. Allen Davis[2] and Sajid Alavi[1]
[1]*Department of Grain Science and Industry; Kansas State University;* [2]*School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University*

In aquatic feed manufacturing, requirements for sustainable ingredients and processing methods are emerging. This research focused on grain sorghum as a sustainable carbohydrate ingredient in aquafeed and studied process sustainability through grinding efficiency and energy inputs. Grain sorghum was ground through 3 hammermill screens (1.27, 1.02 and 0.61 mm) to obtain different particle sizes. Ground sorghum was incorporated into nutritionally balanced diets formulated for shrimp and tilapia and processed through a pilot-scale single-screw extrusion system to produce sinking and floating feed, respectively. As particle size of diets decreased, extruded tilapia feed expansion increased and bulk density decreased (433 to 354 b/L), while energy requirement of the process increased (273 top 335 kJ/kg) leading to improvements of pellet quality aspects including water stability and durability. Higher preconditioner steam loss was observed with lower particle size of raw diets. Increase of thermal energy input into shrimp feed in the preconditioner led to decrease in expansion ratio of pellet from and very little change in bulk density and no noticeable improvement in quality. Higher grinding intensity for grain sorghum improved tilapia feed quality at the expense of higher energy requirements and greater steam loss. Thermal energy input during extrusion did not have a noticeable impact on shrimp feed quality. In optimization of aquafeed procesing, quality improvements should be weighed against process sustainability criteria such as energy input and losses. This data will be useful for feed processors to meet sustainability goals within their organization and future regulations in the aquatic feed industry.

THERE'S A PHOTON IN MY WATER! THE APPLICATION OF ULTRAVIOLET LIGHT TECHNOLOGY TO ENHANCE THE SAFETY OF AGRICULTURAL WATER ON KANSAS FRESH PRODUCE FARMS

Olivia C. Haley[1], Yeqi Zhao[1], Trevor Hefley[2], Logan Britton[3], and Manreet Bhullar[1,4]
[1]Department of Horticulture and Natural Resources, Kansas State University; [2]Department of Statistics, Kansas State University; [3]Department of Agricultural Economics, Kansas State University; [4] Food Science Institute, Kansas State University

Ultraviolet (UV) light-based water treatment systems are an increasingly investigated alternative to chemical sanitizers for agricultural surface water disinfection as they are highly effective, user-friendly, and do not produce toxic by-products. However, there are relatively few studies demonstrating the practical use of UV light for on-farm agricultural water treatment applications. The objective of this project was to test the efficacy of two commercial UV devices to reduce the population of *E. coli* in agricultural water. An on-farm study using three agricultural water sources was performed to determine the efficacy of the Minipure MIN-9 (1-9 gallons per minute (GPM), 1.34-gallon capacity) and SARIN (1-130 GPM, 4.75-gallon capacity) UV systems in natural agricultural water. Colilert with Quanti-tray/2000 (LoD 1 MPN/100mL) methodology was used to enumerate the surviving *E. coli* population after treatment at flow rates of 6, 7, and 9 GPM. RESULTS: The efficacy of the devices was dependent on the device ($p<0.0001$), source ($p<0.0001$), and the observed transmission ($p<0.0001$). The SARIN UV system was more effective in reducing the population of *E. coli* in agricultural waters with a high concentration of UV-absorbing particulate matter (<30 %UVT). The Minipure MIN-9, however, required a lower capital investment for installation, maintenance, and operation. These results demonstrate the efficacy of UV light for reducing the microbial risk of agricultural water. Further studies are needed using different UV devices, flow rates and transmissions to develop guidance on using the UV technology for conventional or hydroponic produce growers.

EFFECTIVENESS OF A BRIEF FILIAL THERAPY MODEL ON CHILD, PARENT, AND RELATIONSHIP OUTCOMES

Lindsay Howard, Glade Topham, and Lindey Schmechel
Department of Applied Family Science, Kansas State University

Filial Therapy is a play therapy parent-child treatment that was developed by Bernard and Louise Guerney in 1964. Filial Therapy helps parents learn and use child-centered play therapy skills to engage with their children, thus improving the parent-child relationship. There have been many studies examining the effectiveness of Landreth's group model of Filial Therapy (CPRT). However, there have been fewer studies examining the efficacy or effectiveness of the Guerney model of Filial Therapy. This study sought to identify various parent and child outcomes of a brief (10 sessions) Filial Therapy program that was adapted from VanFleet's (1994) individual Filial Family Therapy model. This study included 24 parent-child dyads who completed Filial Therapy and completed a series of pre-tests and post-tests. Parents reported on the following: child behavior problems (Eyberg Child Behavior Inventory), parent distress (Brief Symptom Inventory General Severity Index), and parent acceptance of child (Porter Parental Acceptance Scale). In addition, independent observers rated parent communication of acceptance, parent involvement, and allowing child self-direction during parent-child play interactions (subscales of the Measurement of Empathy in Adult-Child Interaction, MEACI). Filial Therapy was found to be effective in promoting positive change in all of the above areas assessed. Effect sizes ranged from .43 to 1.90. These findings indicate that Filial Therapy is effective in decreasing negative child behaviors and increasing positive parenting behaviors within the parent-child relationship. This study highlights the benefits of parents and children participating in Filial Therapy.

IMPACTS OF WOODY ENCROACHMENT ON GRASSLAND WATER YIELD

Rachel Keen[1], Pamela Sullivan[2], Zak Ratajczak[1], Walter Dodds[1], Jesse Nippert[1]
[1]Division of Biology, Kansas State University; [2]College of Earth, Ocean, and Atmospheric Science, Oregon State University

Grasslands and rangelands globally are experiencing woody encroachment – the spread of trees and woody shrubs in historically grass-dominated ecosystems. This process reduces plant biodiversity and forage availability and is increasingly recognized as a threat to water yield because woody species use substantially more water than grasses. In this study at Konza Prairie Biological Station, we used measurements of water-use by shrubs and grasses as well as a historical spatial dataset of vegetation cover to estimate daily watershed-scale water loss through time as woody cover has increased. Previous work has shown that shrubs use water at roughly twice the rate of grasses. We found that woody cover increased by ~20% from 1978-2020, resulting in a ~25% increase in daily water-use in a 53.9 ha watershed. This drastic increase in water-use has likely contributed to observed declines in streamflow at Konza Prairie since the 1980's. We also found that the relationship between streamflow and incoming precipitation has broken down in recent decades – i.e., stream discharge is declining despite an increase in precipitation – and this breakdown is highly correlated with a rapid increase in the rate of woody encroachment in the early 2000's. Greater growing season water-use by shrubs/trees compared to grasses has led to increased watershed-scale water loss as woody encroachment has progressed. This shift has negative implications for water yield on watersheds that support livestock grazing, but also has the potential to impact larger-scale water yield (groundwater, rivers, and reservoirs) across Kansas if woody encroachment continues at a broad spatial scale.

THE COMPLEX RELATIONSHIP BETWEEN NATIVE MYCORRHIZAL COMMUNITY AND PHOSPHORUS ADDITION IN COMMERCIAL MYCORRHIZAL INOCULANT EFFECTIVENESS

Endy Lopes Kailer and Charles W. Rice.
Department of Agronomy, Kansas State University

Arbuscular Mycorrhizal Fungi (AMF) are a group of microorganisms that provide nutritional benefits to around 80% of all plants. Our research aimed to assess the colonization potential of a commercial AMF inoculant with different soil types and phosphorus (P) fertilization. Corn was grown in the greenhouse with three low P non-sterilized soils. Two soils were in current agricultural production, and the other soil was in the native prairie. Treatments included two levels of P (0 and 135 kg/ha of P_2O_5) and mycorrhizal inoculation with spores of *Rhizophagus irregularis* (no inoculation and inoculated) with four replicates in a completely randomized block design . Corn aboveground and root biomass were collected after 50 and 70 days. Nutrient uptake in roots and shoots was determined, and mycorrhizal colonization of the roots was assessed. Corn that received phosphorus fertilization had a statistically significant increase from two to four times in growth and nutrient levels (shoots and roots) in all soils. The inoculant did not significantly affect plant growth. Phosphorus fertilization partially inhibited colonization. Plants grown in the agricultural soils were colonized by the inoculant. Corn grown in the native prairie soil was not colonized by the inoculant because of the high populations of native AMF. Commercial inoculants can successfully colonize corn roots in soils from the agricultural sites. Future research will evaluate AMF colonization, corn growth, and yield in field conditions.

SURVEILLANCE OF *ECHINOCOCCUS MULTILOCULARIS* IN COYOTES IN THE MIDWEST UNITED STATES

[1]Kamilyah R. Miller, [2]Todd M. Kollasch, [3]William Ryan, and [1]Brian H. Herrin
[1]Department of Diagnostic Medicine and Pathobiology, Kansas State University; [2]Elanco Animal Health; [3]Ryan Mitchell Associates LLC

Coyotes are routinely trapped for fur trading and nuisance control. Carcasses were collected from Kansas (n=23) and Missouri (n=13). Intestinal tracts were removed, frozen at -80°C for at least 7 days, thawed, and then processed by sifting, filtration, and counting technique to identify adult *Echinococcus* spp. Positive samples, were morphologically and molecularly identified using PCR. Evidence of any other intestinal parasites was recorded.
Ten of the 36 coyote carcasses (KS= 8/23; MO= 2/13) were positive for adult *Echinococcus multilocularis*. All positive samples were morphologically, and molecularly, identified as *E. multilocularis* with sequences closely matching previously published sequences. In addition to *Echinococcus* spp., other common intestinal parasites of domestic dogs were detected.

PHYSICS IN THE FIELD: APPLICATION OF A FIELD-DEPLOYABLE ULTRAFAST LASER TO MEASURE AGRICULTURAL SIGNIFICANT GASES

Lindsay Morris[1], Chinthaka Weerasekara[2], Daniel Herman[3,4], Brett DePaola[1], Eduardo Santos[2], Stephen Welch[2], and Brian Washburn[3]
[1]Department of Physics, Kansas State University; [2]Department of Agronomy, Kansas State University; [3]National Institute of Standards and Technology; [4]Department of Physics, University of Colorado Boulder

Worldwide interest in greenhouse gas emissions have prompted studies into new techniques for remote gas sensing, particularly in agriculture, where enteric fermentation from cattle is one of the largest sources of anthropogenic methane emissions in the US. We focus on measurements of these cattle emissions by deploying a mobile open-path near-infrared dual-comb spectroscopy (DCS) system in the field without the need for external calibration. The previous measurement of methane emissions from a feedlot resulted in time-resolved concentration enhancements of methane, ammonia, carbon dioxide, and water, which we then used in conjunction with weather data to calculate fluxes for these gases of interest. For comparison, the DCS system was run in parallel with a commercial cavity-ring down spectroscopy system, resulting in a methane flux agreement within 6%. Ammonia flux from the feedlot was also measured with part-per-billion precision. Currently, there are no technologies capable of detecting with precision and temporal resolution the methane emissions from grazing cattle, but our previous results show the combination of the DCS system with existing atmospheric dispersion models can fill this void. To verify that, current efforts focus on honing our equipment precision to measure concentration enhancements of approximately 0.2 parts per billion through a controlled release of methane study in a pasture. This is preparatory to measuring net methane production from cattle in a pasture environment. Further development has also focused on the remote capabilities of the system and its robustness against harsh weather conditions and long-term outdoor measurements.

IMPACT OF CRICKET PROTEIN POWDER ADDITION ON WHEAT DOUGH PROPERTIES AND BREAD QUALITY

Mayra Perez-Fajardo[1], Hulya Dogan[1], and Scott Bean[2]
[1]Department of Grain Science and Industry, Kansas State University; [2]United States Department of Agriculture-Agricultural Research Service (USDA-ARS), Grain Quality and Structure Research Unit, Manhattan, KS

Use of alternative protein sources have become more popular due to a continuing rise in population,

environmental concerns, and a shift in consumers' demands for eating more sustainable foods. As an emerging novel protein source, insect proteins, provide many benefits such as requiring fewer resources compared to the traditional raising of livestock and having lower greenhouse gas emissions than beef, poultry, and pork. However, not much research has been done on their incorporation into food formulations. This study aimed to see how the incorporation of cricket protein powder would affect the dough properties and the quality of wheat bread. Two commercially available cricket protein powders, Entomo Farms (E) and GrioPro (G) were first characterized for their functional properties by evaluating protein solubility and water holding capacities. 10 or 20% incorporations of E and G into wheat doughs were evaluated for dough development properties, dough extensibility, and change in wheat protein composition in the doughs. Breads containing 5, 10, or 20% inclusions of E or G underwent color, texture, and staling analysis. Processing differences led to different cricket protein functionalities which in turn resulted in differing effects on both the dough properties and final bread quality. The incorporation of G led to stronger, more stable doughs with higher water absorption. Dough extensibility and loaf volume decreased at high E and G inclusion levels. Low incorporations of cricket protein powders into bread are feasible. Higher inclusion levels cause the production of dense bread that is not on par with consumer standards.

PRINTABLE CONDUCTING LAYERED MATERIALS FOR ELECTRONIC AND ENERGY APPLICATIONS

Shiseido Robinson[1], Rajavel Krishnamoorthy[1], and Suprem R. Das[1,2]

[1]Department of Industrial and Manufacturing Systems Engineering, Kansas State University; [2]Department of Electrical and Computer Engineering, Kansas State University

The 21st century is majorly focusing on rapid progression on making smart energy storage devices preferably supercapacitors which are linked in development of ultrafast energy harvesting applications. Incorporating intelligence in energy storage devices in electronic device manufacturing industry is most wanted and still meets several challenges. Hence, development of ultra-performance energy storage devices that are manufactured in the process of utilizing thin functional material with low-cost have a great potential to offer biodegradable and recyclable solutions. Two-dimensional layered transition metal carbide (MXene) has been identified as a hot material interest in energy application. Realization of effective use of smart materials in energy applications still has lot of challenging tasks. In this present study, printed highly flexible supercapacitor using few layer MXene ($Ti_3C_2T_x$) ink has been demonstrated, which are prepared from chemical exfoliation process by selective removal of Al (Aluminum) layer from Ti_3AlC_2. The exfoliated $Ti_3C_2T_x$ was used as an ink that was patterned onto a desired flexible substrate for fabricate supercapacitor devices. Our fabricated printed devices give high charge storage capacity with high energy densities. The tested multiple charge-discharge cycles validate that our fabricated supercapacitors have extended life cycles. The development of printed flexible supercapacitors using interesting materials is more important to make new energy storage technology. This fabrication process has trailblazed in not only low-cost and safe to our ecosystem but also opened an avenue for future advancements where this energy can possibly be more accessible and available in our daily lives.