Assessing the impacts of weather in western grazing beef females

Prepared by Dr. Gleise M. Silva, Camila Londono, and Sergio Lasso

One of the major goals for the livestock industry worldwide is to ensure adequate food supply for the growing population. However, climate change may impose an additional challenge to this activity by increasing the duration, severity, and spatial distribution of extreme weather events. Greater variation in environmental conditions has been documented in Western Canada with the summer of 2021 being one of the warmest on record. On the other extreme, record low temperatures were also registered in December 2021.

Environmental effects on cattle productivity*:* Cattle are homeotherm animals, which means they maintain a relatively constant body temperature over a wide range of environmental conditions to optimal function and survival. For that, an animal must be in thermal equilibrium with the environment, which includes an adequate combination of radiation, air temperature, air movement, and humidity.

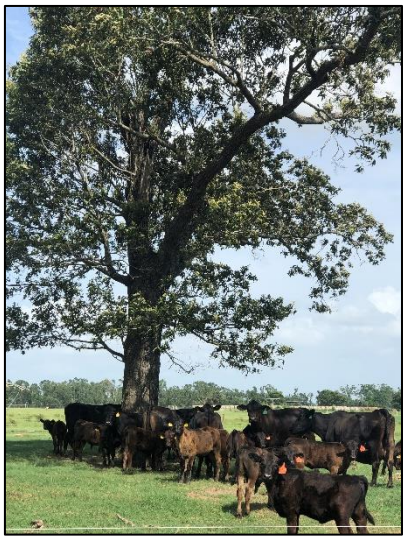

Figure 1. Grazing beef females seeking shade during summer.

Environmental stress (cold or heat stress) occurs when air temperature deviates from the animal's thermoneutral zone, affecting production or causing discomfort. Cattle become heat stressed when the animal heat load is greater than the animal's ability to dissipate the heat to the environment. The ability to lose heat is determined by environmental conditions (e.g., humidity, wind speed) as well as animal individual capacity (e.g., breed, hair coat, age, etc.). Cattle have several physiological and behavioral strategies to overcome the effects of cold or heat stress. During warmer weather, cattle can increase water consumption, sweating and respiration rates, reduce feed intake, and seek for shaded areas (Figure 1) to minimize solar radiation exposure. Under colder temperatures, cattle will increase feed intake to maximize heat production. When those strategies are not enough to maintain adequate heat loss or gain, productivity is reduced. Feed efficient cattle might have lowered nutrient requirements which could represent greater resilience to extreme weather conditions since there is an increase in energy requirements associated with thermoregulation during cold and heat extremes. Therefore, understanding the potential of more feed efficient heifers to endure the extremes of intensified weather conditions could be a key aspect of a resilient beef production system.

Cattle have been selected for feed efficiency to reduce feeding costs and environmental impact but knowledge on how more feed efficient beef cattle on forage-based systems respond to environmental conditions (e.g., winter vs. summer) is still needed. It also remains unclear

whether these relationships (RFI and weather resilience) would be more important during one season over another (e.g., summer vs. winter). Such information is necessary to understand the impacts of weather in animal production in our unique environment to support a more resilient beef production in the face of a changing climate.

Research Project: Our current study (Figure 2), funded by the Alberta Beef Producers, will address this knowledge gap by identifying physiological and behavioral changes employed by heifers with divergent RFI during natural fluctuations in weather conditions (e.g., summer and winter 2022-2023) at Kinsella Research Ranch. We hypothesized that more feed efficient beef heifers are more weather resilient because of their greater efficiency in energy utilization, resulting in maintenance of adequate behavior, body weight, and physiological status compared to less efficient animals. During summer 2022, we are testing this hypothesis by measuring behavioral (e.g., time spent walking and lying) and physiological responses (blood metabolites) of cattle throughout summer. Winter evaluations will occur in 2023.

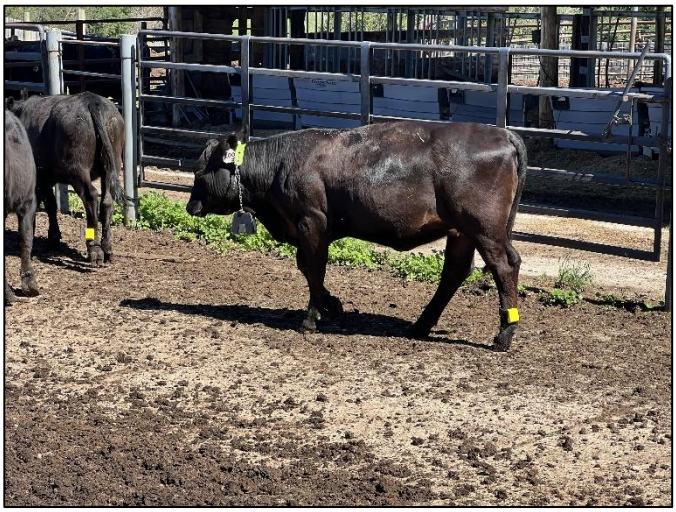

Figure 2: Heifer fitted with a pedometer (IceRobotics) to assess behavioral (activity) responses during summer 2022.

The Alberta Beef Producers (ABP) and the Canadian Agricultural Partnership are supporting this study. We are thankful for the support received by ABP, researchers' Co-PIs at University of Alberta and the Kinsella Research Ranch staff.

Contacts:
Dr. Gleise M. Silva
BCRC-Hays Chair in Beef Production Systems
University of Alberta
gleise.silva@ualberta.ca

Camila Londono and Sergio Lasso
Graduate Students
University of Alberta

UNIVERSITY OF ALBERTA

SINCE 1969 Alberta Beef Producers