David Little Livestock
Range Management Endowment
AT THE UNIVERSITY OF IDAHO

2019 Project Progress Report:

Investigating seasonal changes in the nutritive value of invasive grass species to aid in their control using targeted grazing on Idaho Rangeland

By Gwinyai E. Chibisa & K. Scott Jensen

PERSONNEL:

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PRELIMINARY RESULTS for (2019):

BACKGROUND:

The widespread invasion of annual grasses, including cheatgrass (*Bromus tectorum* L.) and medusahead (*Taeniatherum caputmedusae* L.), is one of the major threats to sustainable rangeland use in Idaho. Therefore, there is an urgent need for management strategies to control these invasive grasses on rangeland. Targeted grazing could be used to maintain the health and function of rangelands. Because cheatgrass and medusahead require dead litter that is laying down for them to establish and dominate, grazing could be a powerful tool in controlling their spread (Perryman et al., 2018). However, unless grazed early in the season (spring/early summer), cattle tend to avoid cheatgrass and medusahead possibly in part because of their low nutrient composition and digestibility. Although there are reports that cattle graze an increasing amount of these invasive grasses in fall, possibly as a result of the moisture received during this period, it is not clear whether this occurs as a result of changes in nutrient composition and/or digestibility. Understanding the factors that could explain the increase in the grazing of cheatgrass and medusahead in fall is key to developing targeted grazing strategies that can increase the health and function of Idaho rangelands by reducing these species. Therefore, we investigated the changes in nutrient composition and digestibility of cheatgrass and medusahead harvested on Idaho rangeland as the season changed from summer, to fall, and then winter.

HYPOTHESIS or OBJECTIVES:

Objective: Investigate the effect of changing season (summer, fall, and winter) on nutrient composition (including crude protein, total digestible nutrients, and fiber) and digestibility of cheatgrass and medusahead harvested on Idaho rangeland.

PROCEDURES:

Cheatgrass and medushead samples were collected in the Reynolds Creek watershed in June 2018 (summer), September 2018 (fall), and January 2019 (winter). After collection, samples were transported to the laboratory, ground, and analyzed for dry matter (DM), crude protein (CP), neutral detergent fiber (NDF), and total digestible nutrients (TDN) using standardized methods (AOAC, 1995). Dry matter and fiber (NDF) digestibility were evaluated in the laboratory by incubating the collected samples together with rumen fluid that was collected from beef cattle. This mimics what happens in the rumen of cattle that consume the forages. Briefly, on the day of incubation, 1.5 g of each of the forage samples was added to 2 measurement glass vials. Rumen fluid that was collected from 2 ruminally-fistulated beef cows was added to the vials containing the forage samples. Vials were then incubated at 39°C for 24 h. After incubation, what remained

(residues) were weighed and analyzed to determine the amount of dry matter and fiber that disappeared/was digested by the rumen microbes.

ACCOMPLISHMENTS or RESULTS:

To complete the study, cheatgrass and medusahead samples that were harvested in the Reynolds Creek watershed in June and September 2018, and January 2019 were dried, ground, and analyzed (nutrient composition and digestibility) in Dr. Chibisa's ruminant nutrition laboratory in the Animal and Veterinary Science Department on campus.

Results: Cheatgrass harvested in summer contained a greater amount of crude protein (CP) than medusahead [14.1% (Figure 1) vs. 10.6% (Figure 2)]. However, for both grasses, there was a dramatic decrease in the CP content in fall and winter (Figure 1 and 2). In both seasons (fall and winter), the CP content averaged 3.9%, which is over 2-fold lower than the 9% CP required in feeds to maximize the digestion of feedstuffs in the rumen of beef cattle. The total digestible nutrients (TDN) content was also greater for cheatgrass than medusahead in summer [66% (Figure 1) vs. 55% (Figure 2)], with the content decreasing dramatically in both grasses in fall and winter. However, the fiber content of both grasses increased with advancing maturity (fall and winter compared to summer), which was expected.

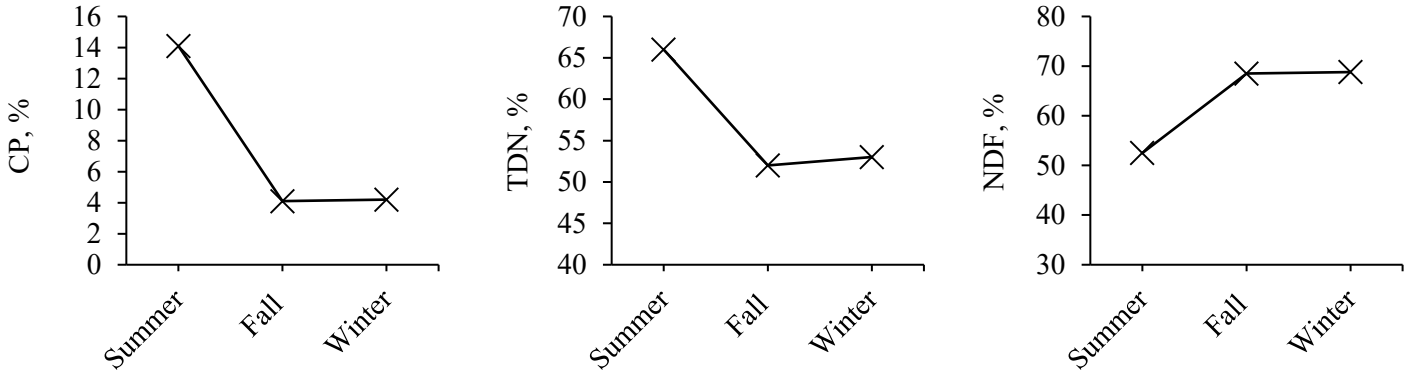

Figure 1. Crude protein (CP), total digestible nutrients (TDN), and neutral detergent fiber (NDF) content of cheatgrass

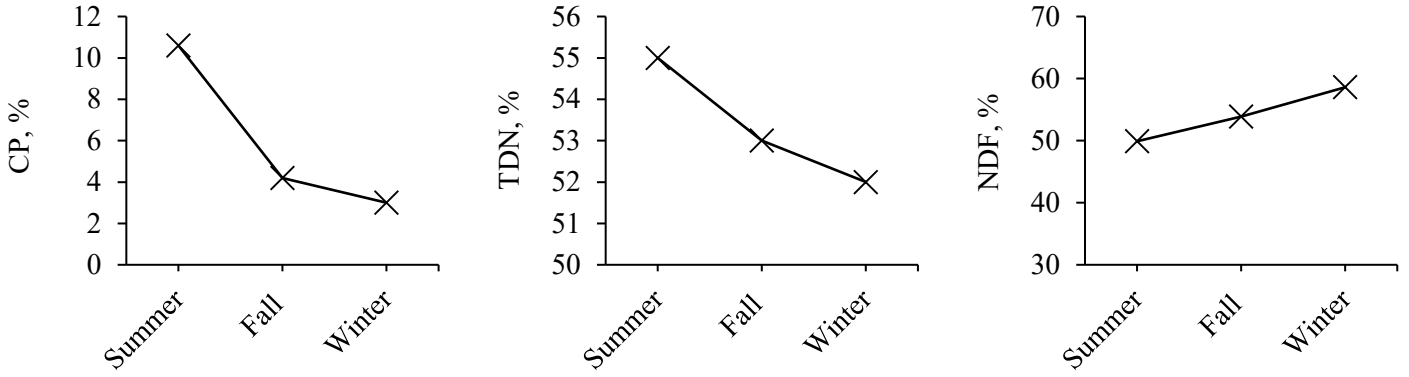

Figure 2. Crude protein (CP), total digestible nutrients (TDN), neutral detergent fiber (NDF) content of medusahead

The amount of dry matter that was digested in the rumen was greater for cheatgrass than medusahead (62.9% vs. 51.3%) when harvested in summer (Figure 3). Similarly, the amount of fiber that was digested in the rumen was greater for cheatgrass than medusahead (49.7% vs. 44.9%) in summer (Figure 4). This can be explained by the greater protein (CP) and energy (TDN) content for cheatgrass than medusahead in summer, which was favorable for the growth of the rumen microbes that digest/ferment feed. Although there were no differences in dry matter and fiber digestibility between the two grasses in fall and winter, dry matter digestibility decreased by a magnitude of 45 to 50%, whereas fiber digestibility decreased by a magnitude of 47 to 59%, as the season advanced from summer to fall and winter. This decrease in digestibility was due to the observed decrease in CP and TDN content and increase in NDF content in fall and winter.

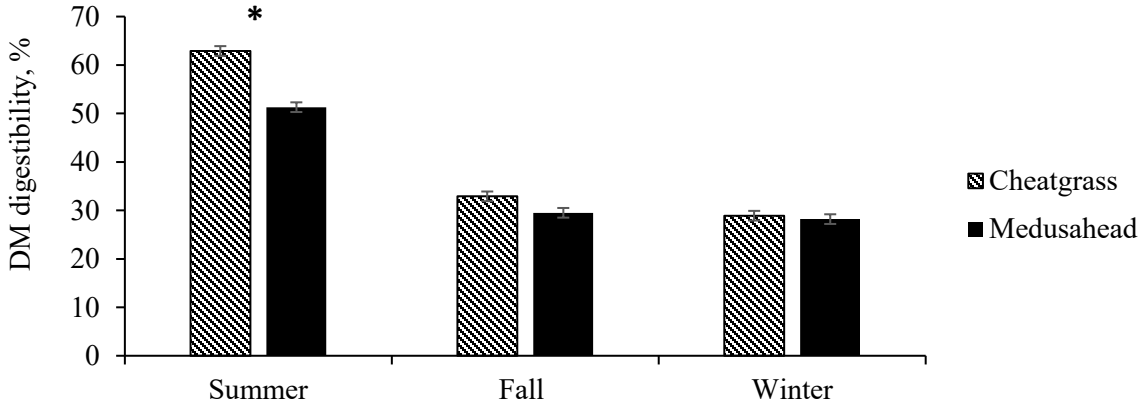

Figure 3. Percentage of dry matter (DM) digested in the rumen of beef cattle fed either cheatgrass or medusahead
The asterisk (*) indicates that dry matter (DM) digestibility was greater for Cheatgrass than Medusahead in Summer; however, DM digestibility was similar for the 2 grass species in both Fall and Winter.

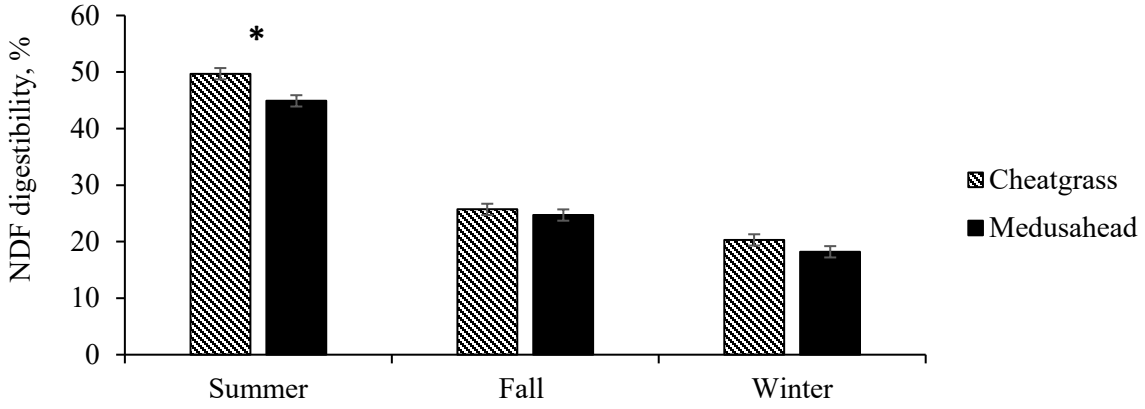

Figure 4. Amount of fiber (NDF) digested in the rumen of beef cattle fed either cheatgrass or medusahead
The asterisk (*) indicates that fiber (NDF) digestibility was greater for Cheatgrass than Medusahead in Summer; however, fiber digestibility was similar for the 2 grass species in both Fall and Winter.

Summary: Cheatgrass had a greater nutritional value (greater CP and energy content, lower fiber content, and greater dry matter and fiber digestibility) than medusahead in summer. However, for both grasses, there is a dramatic and comparable decrease in nutritive value beyond summer, which can compromise forage intake, digestibility, and animal performance. We had anticipated an increase in nutritive value due to moisture received in fall; however, this was not the case. Precipitation accumulation [Idaho SNOTEL Site Reynolds Creek (2029)] was 0.0, 1.4, 1.5, and 1.9 inches for the months of September, October, November, and December 2018, respectively. Therefore, it is possible that outcomes could be different if there is greater accumulation of precipitation in the fall months.

Based on our results, cattle producers now know that the quality of these invasive grass species declines rapidly, and that the moisture received in Fall (especially if limited) might not result in an increase in nutrient digestibility. Therefore, this might necessitate the need for a protein and/or energy supplement later in the season (Fall/Winter grazing) when possible, to potentially increase dry matter and fiber digestibility, which increases intake and nutrient supply. Therefore, the next critical question (**future work**) is, **does supplementation (energy and/or protein) in Fall increase nutrient digestibility of these forages, which has an impact on intake and performance/the bottom line?**

PUBLICATIONS or OUTPUTS:

a. Myers C. A., K. S. Jensen, G. E. Chibisa. 2019. *In vitro* fermentation characteristics of Cheatgrass (*Bromus tectorum* L.) and Medusahead (*Taeniatherum caputmedusae* L.) harvested on Idaho rangeland in different seasons. Journal of Animal Science. 97(Suppl. 3): 246-247. Doi:10.1093/jas/skz258.501

b. Myers C. A., K. S. Jensen, G. E. Chibisa. 2020. *In vitro* fermentation characteristics of Cheatgrass (*Bromus tectorum* L.) and Medusahead (*Taeniatherum caputmedusae* L.) harvested on Idaho rangeland in different seasons. Official Proceedings of the 55th Annual Pacific Northwest Animal Nutrition Conference. Page 149