

Effect of Protein Supplementation on Digestibility of Cheatgrass and Medusahead when Harvested in Spring or Fall

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Introduction

- Medusahead and Cheatgrass, which are invasive grasses, have become widespread throughout the Great Basin of the Northwest (Medusahead Management Guide - UC Weedric, 2014).
- Both grasses are detrimental because once they dominate, they reduce biodiversity, alter and degrade native habitats, and contribute to fuel for dangerous and destructive fires.
- Therefore, there is a need for strategies to control their spread and domination on rangeland, and grazing could be one such strategy.
- Because they contain a high amount of protein and minerals, and a low amount of fiber in early Spring (high quality), cattle could consume a lot of Medusahead and Cheatgrass.
- However, cattle will consume less of these grasses in Fall when their protein content is low and fiber content is high (low quality), which makes them less digestible in the rumen (Allen, 2000).
- Therefore, providing protein supplements, which are needed by the microbes in the rumen to grow and multiply, could increase digestibility and how much cattle graze.
- Foe example, it was previously reported that “a 1% increase in in dietary crude protein content increases feed intake by up to 1.9 lb/day due to an increase in digestibility,” (Allen 2000).
- Therefore, although this information is still not available, providing protein supplements to cattle grazing Medusahead and Cheatgrass could increase digestibility and how much they can consume especially in Fall, which can help in controlling their spread.

Objective

- The objective of this study was to determine the effect of providing protein supplements on dry matter and fiber digestibility of Medusahead and Cheatgrass harvested in Spring when their quality is high compared to Fall when quality is poor.

Material and Methods

Nutrient Composition Analysis

- Ground samples of Cheatgrass and Medusahead were collected in Spring and Fall and were analyzed for crude protein, acid detergent fiber (ADF), and neutral detergent fiber (NDF).

In Vitro Digestibility Determination

- Samples of Cheatgrass and Medusahead were placed in Ankom filter bags, which were sealed and placed into vials along with 225 mL of an anerobic buffer and 75ml of rumen fluid collected from canulated cows.
- One of three supplements was then added to each of the vials:
 - 1) no supplement (CON)
 - 2) distillers' grains protein supplement (DDGS)
 - 3) range cattle supplement (PURINA)
- Thereafter, vials were then incubated for 48 hours.
- After 48 hours bags were placed in cold water to stop fermentation and the remaining residues were then analyzed for dry matter and fiber (NDF) to determine how much was digested.

Statistical Analysis

- Data was analyzed using PROC MIXED in SAS (SAS Inst. Inc., Cary, NC).

Results

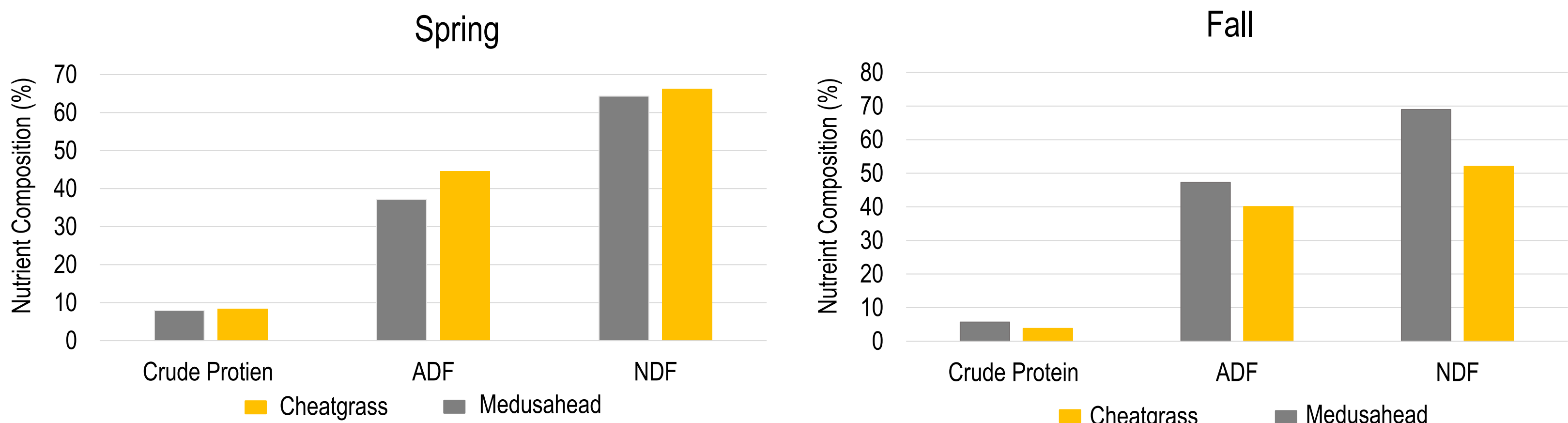


Figure 1. Nutrient composition of Cheatgrass and Medusahead when harvested in Spring or Fall

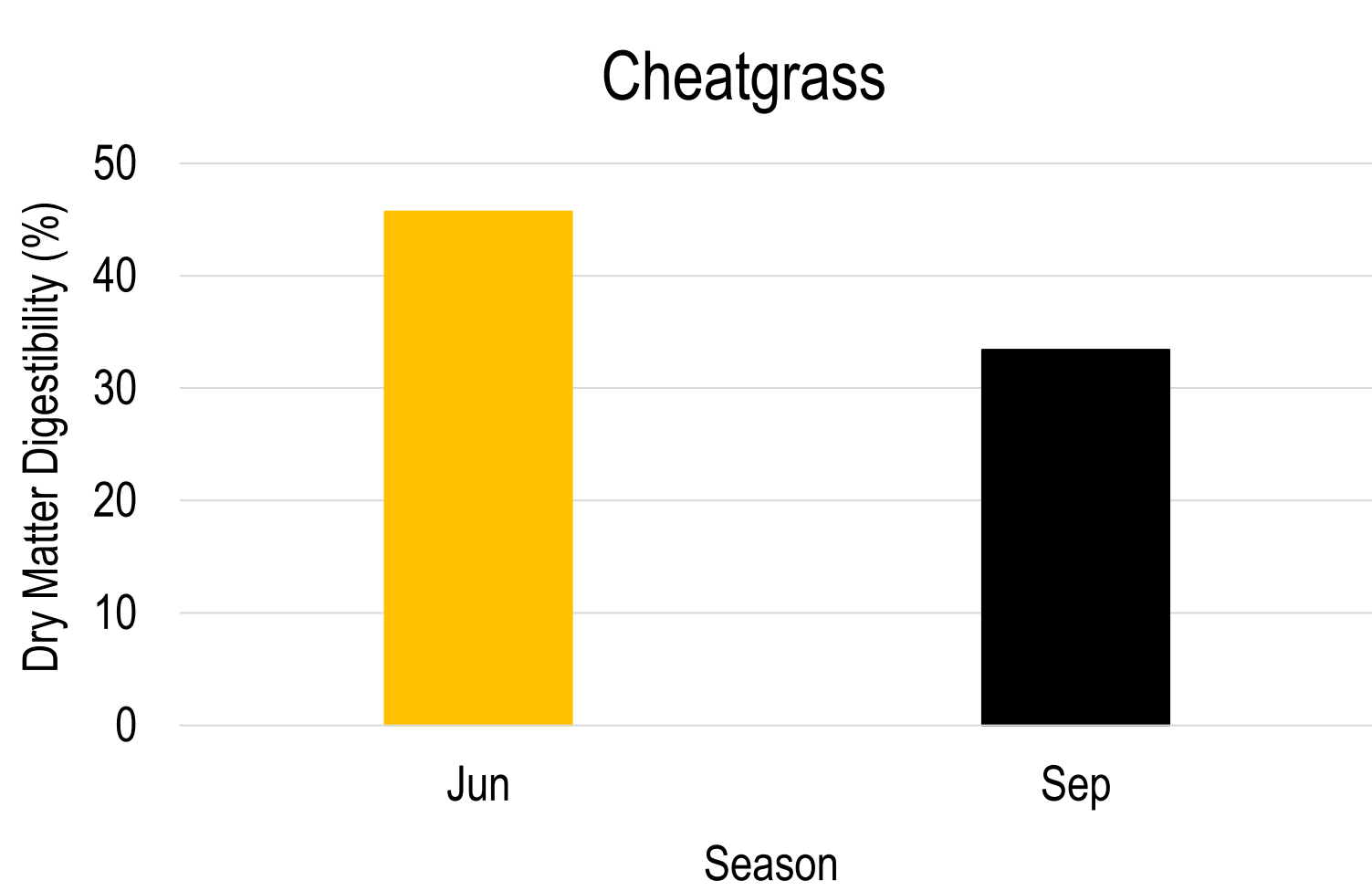


Figure 2. 48-h in vitro dry matter digestibility for Cheatgrass when harvested either in Spring or Fall

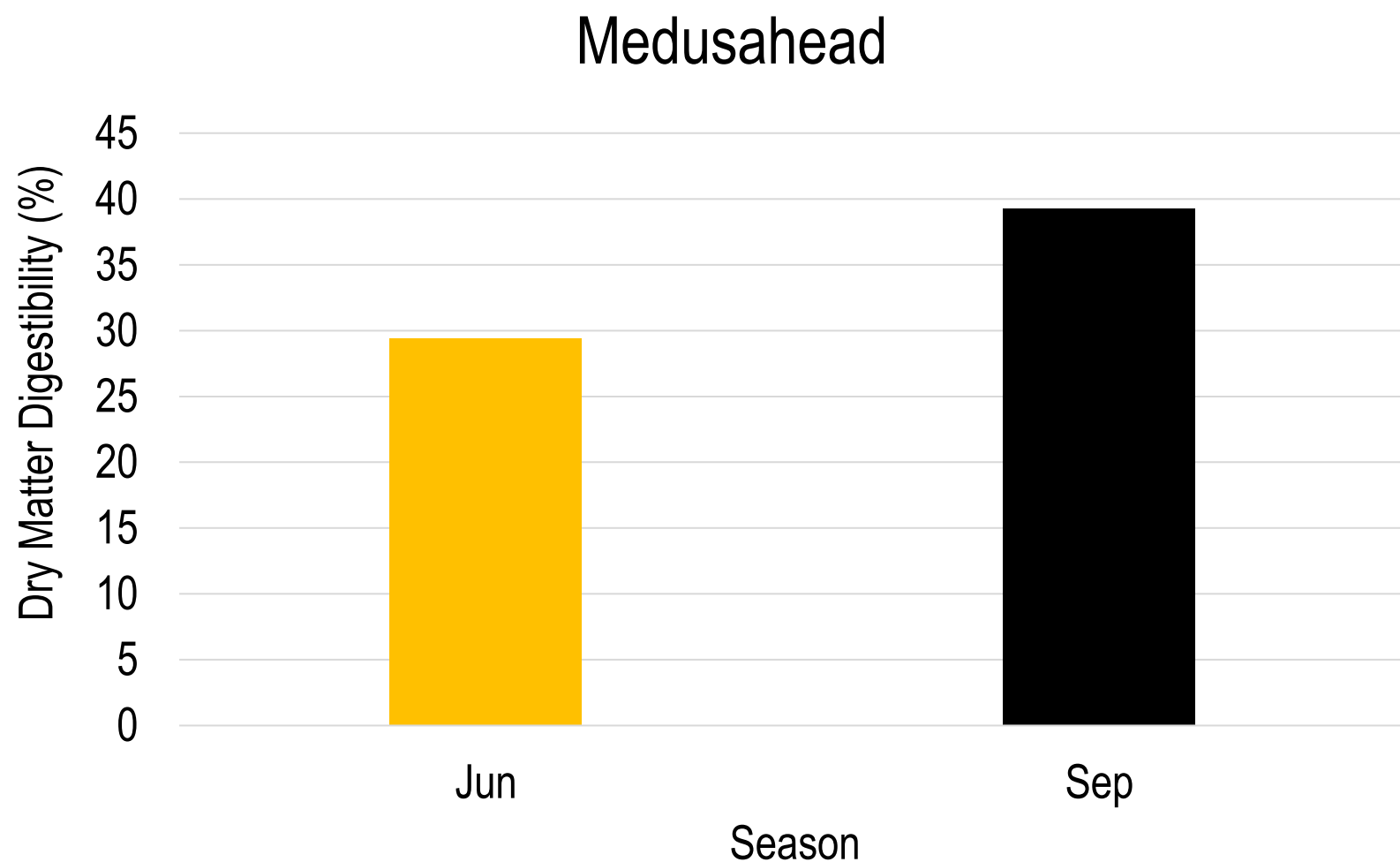


Figure 3. 48-h in vitro dry matter digestibility for Medusahead when harvested either in Spring or Fall

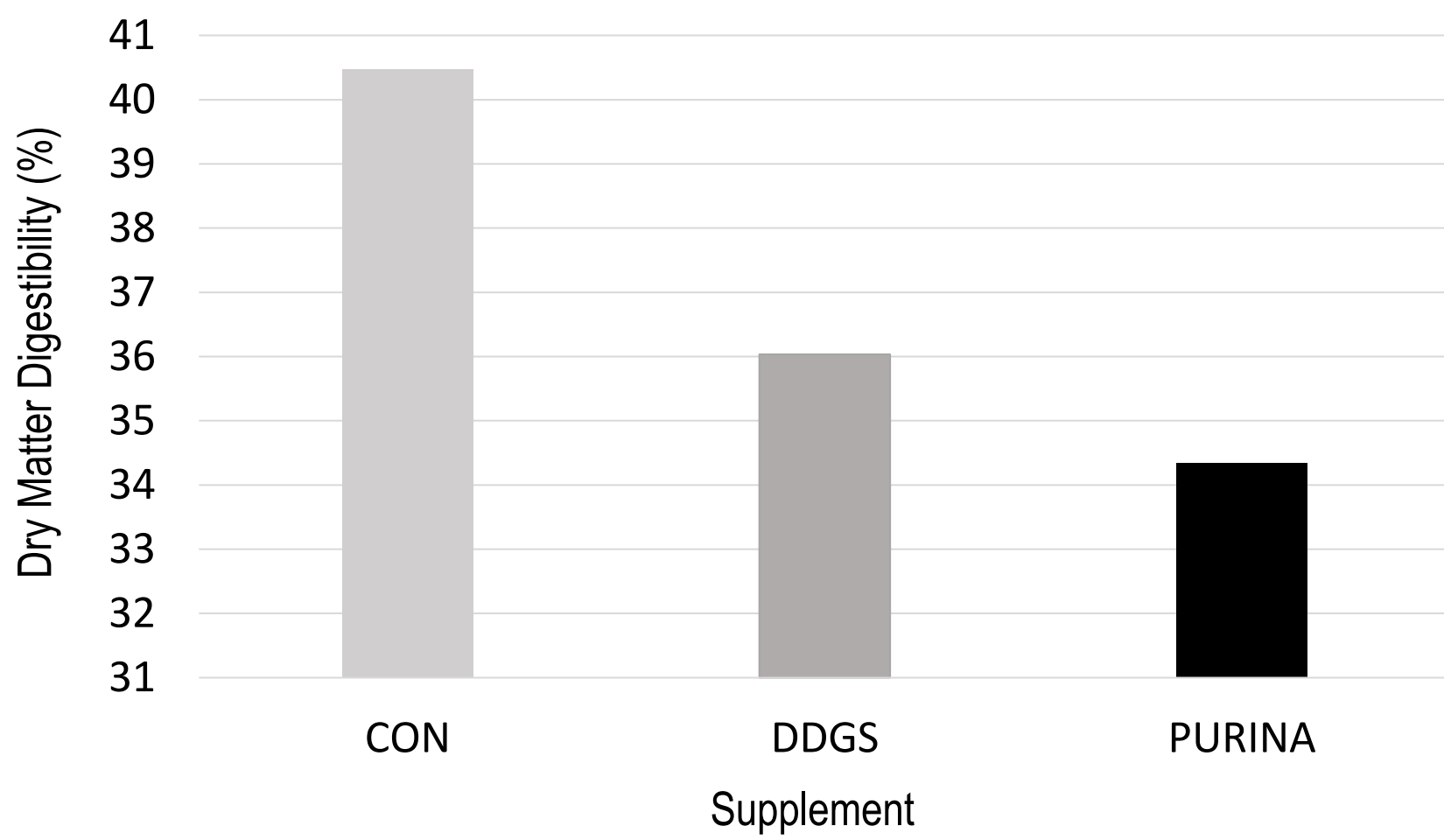


Figure 4. Average dry matter digestibility for Medusahead and Cheatgrass without protein supplement (CON), and with Distillers' Grains (DDGS), or a range cattle supplement (PURINA)

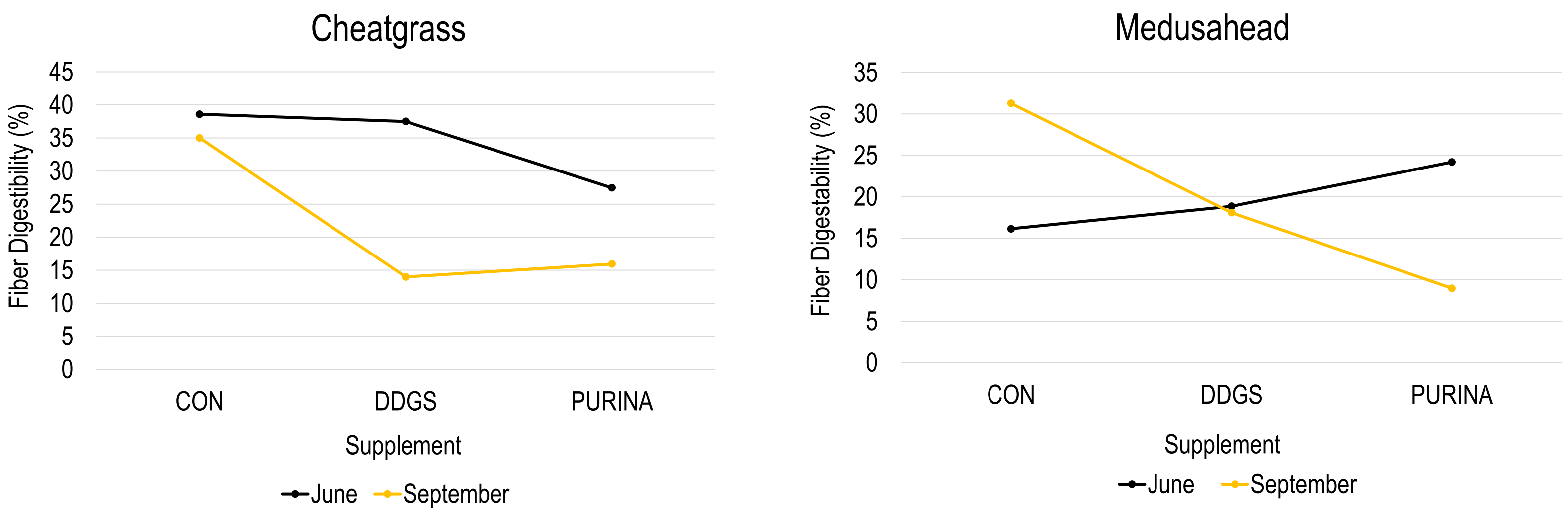


Figure 5. 48-h fiber digestibility for Medusahead or Cheatgrass without protein supplement (CON), and with Distillers' Grains (DDGS), or a range cattle supplement (PURINA)

Summary

Nutrient Composition

- In Spring, Cheatgrass had a higher crude protein (8.3% vs 7.9%), ADF (66.2 vs 64.3%), and NDF (69.0% vs 52.1%) content compared to Medusahead (Figure 1). However, in Fall, Cheatgrass had a lower crude protein (3.8 vs. 5.7%), ADF (40.1 vs 47.3%), and NDF content (52.1 vs 52.1%) compared to Medusahead.

Dry Matter and Fiber Digestibility

- Dry matter digestibility for Cheatgrass was greater in Spring compared to Fall (45.7 vs 33.4%; Figure 2).
- Dry matter digestibility for Medusahead was lower in Spring compared to Fall (29.4 vs 39.3%; Figure 2).
- In Spring, Cheatgrass had a higher dry matter digestibility compared to Medusahead (45.7 vs 39.3%). However, in Fall, Cheatgrass had a lower dry matter digestibility than Medusahead (33.4 vs 39.3%).
- Overall, protein supplementation resulted in a decreased in dry matter digestibility (CON = 40.5%; DDGS = 36.04%; PURINA = 34.3%) (Figure 4).
- Fiber digestibility of Medusahead increased with protein supplementation (CON = 16.2%; DDGS = 18.9%; PURINA = 24.2%) in Spring. However, fiber digestibility decreased with protein supplementation (CON = 31.3%; DDGS = 18.1%; PURINA = 8.98%) in Fall (Figure 5).
- Fiber digestibility of Cheatgrass decreased both in Spring (CON = 38.6%; DDGS = 37.5%; PURINA = 27.5%) and Fall (CON = 35.0%; DDGS = 14.0%; PURINA = 15.9%) with the addition of protein supplements (Figure 6) .

Conclusion

- Cheatgrass has a greater nutritive value than Medusahead in Spring; however, that changes in Fall when the nutritive value is greater for Medusahead.
- Protein supplementation could be beneficial in increasing fiber digestibility for cattle grazing Medusahead in Spring but not in Fall.
- However, providing both DDGS and PURINA supplements could be detrimental to both dry matter and fiber of Cheatgrass across seasons.

References

- Allen, 2000. Effects of diet on short-term regulation of feed intake by lactating diary cattle. J. Dairy Sci. 83:1598-1624.
- AOAC. 1990. Official Methods of Analysis. 15th ed. Association of Official Analytical Chemists, Arlington, VA.
- Medusahead Management Guide - UC Weedric. Retrieved October 14, 2021, from https://wric.ucdavis.edu/publications/medusaheadmanagementguide_pub_2014.pdf.