Alfalfa response to boron application at various water regimes

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Introduction

- Alfalfa is known for its high dry matter yield, forage quality, and adaptability to wide-range of soil types and climatic conditions (Dordas, 2006)
- It’s yield increases with increase in water application (Donovan and Meek, 1983)
- Alfalfa removes larger amount of boron (B) compared to many other crops (Shorrocks, 1997)
- Boron fertilization for alfalfa has not been specifically evaluated under Montana conditions and different water regimes
- Evaluating strategic rates of B fertilization and irrigation for various soils and environmental conditions in Montana may help to improve alfalfa production and forage quality

Research Question

- Can yield and forage quality of alfalfa be enhanced through B and water optimization?

Objective

- To examine the effect of irrigation and B on yield and different forage quality parameters: crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), total digestible nutrients (TDN) and relative feed value (RFV)

Materials and Methods

- Research site: Northwestern Ag Research Center, Creston, MT
- Three irrigation (main-plot) and five B (sub-plot) treatments were replicated four times in split-plot design
- A foliar application of a 10% liquid B solution was applied using a CO2-pressurized backpack sprayer
- Surface drip irrigation; irrigated when 35% plant-available water was depleted
- Evapotranspiration (ET) based soil water balance approach was used
- Harvested at 10% bloom
- Plant samples were collected to determine: Dry Matter (DM) yield, plant tissue B content, and forage quality (CP, ADF, NDF, TDN, and RFV)
- Data were analyzed using the PROC GLIMMIX in SAS

Results- Yield

- Irrigation increased alfalfa yield by 45% in 2016 and 12% in 2017
- No yield difference between 50ET and 100ET
- Yield was not significantly affected by boron in either year

Results- Petiole Boron Concentration – Irrigation Effect

- Irrigation increased petiole B concentration
- Dashed (----) line indicates sufficiency level (Kelling, 1999)

Results- Petiole Boron Concentration – Boron Effect

- Boron application increased petiole B concentration
- Dashed (----) line indicates sufficiency level (Kelling, 1999)

Conclusions

- Alfalfa yield was significantly increased with irrigation application
- No difference in yield between 50ET and 100ET
- Plant tissue B content was positively influenced by irrigation and B fertilization but did not correlate to alfalfa yield and quality
- Boron fertilization did not impact alfalfa yield

Acknowledgements and References

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Kelling, K.A. 1999. UWEX A2522. Univ. of Wisconsin Ext., Madison, WI