

Effect of irrigation and boron fertilizer on yield and forage quality of alfalfa

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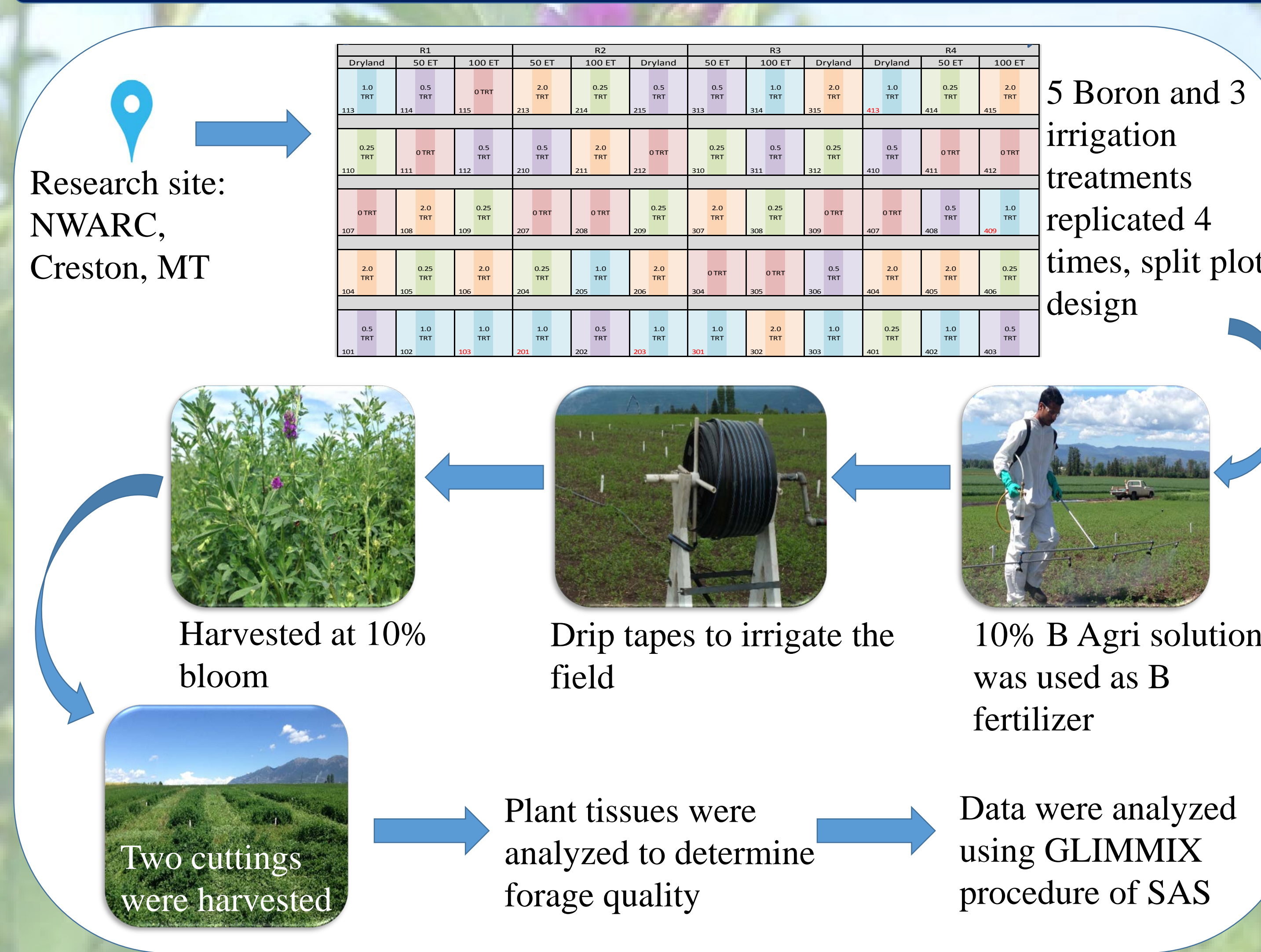
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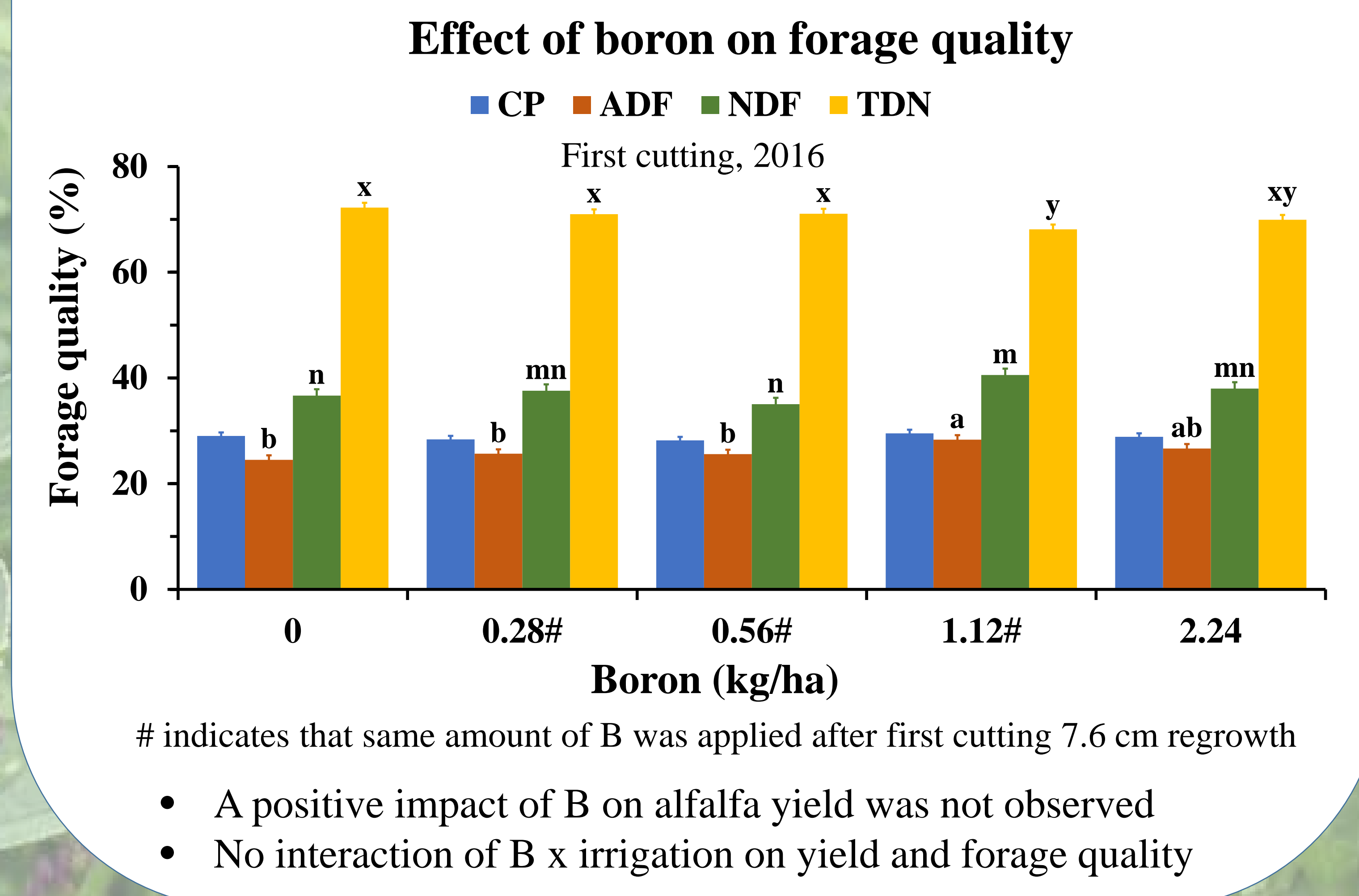
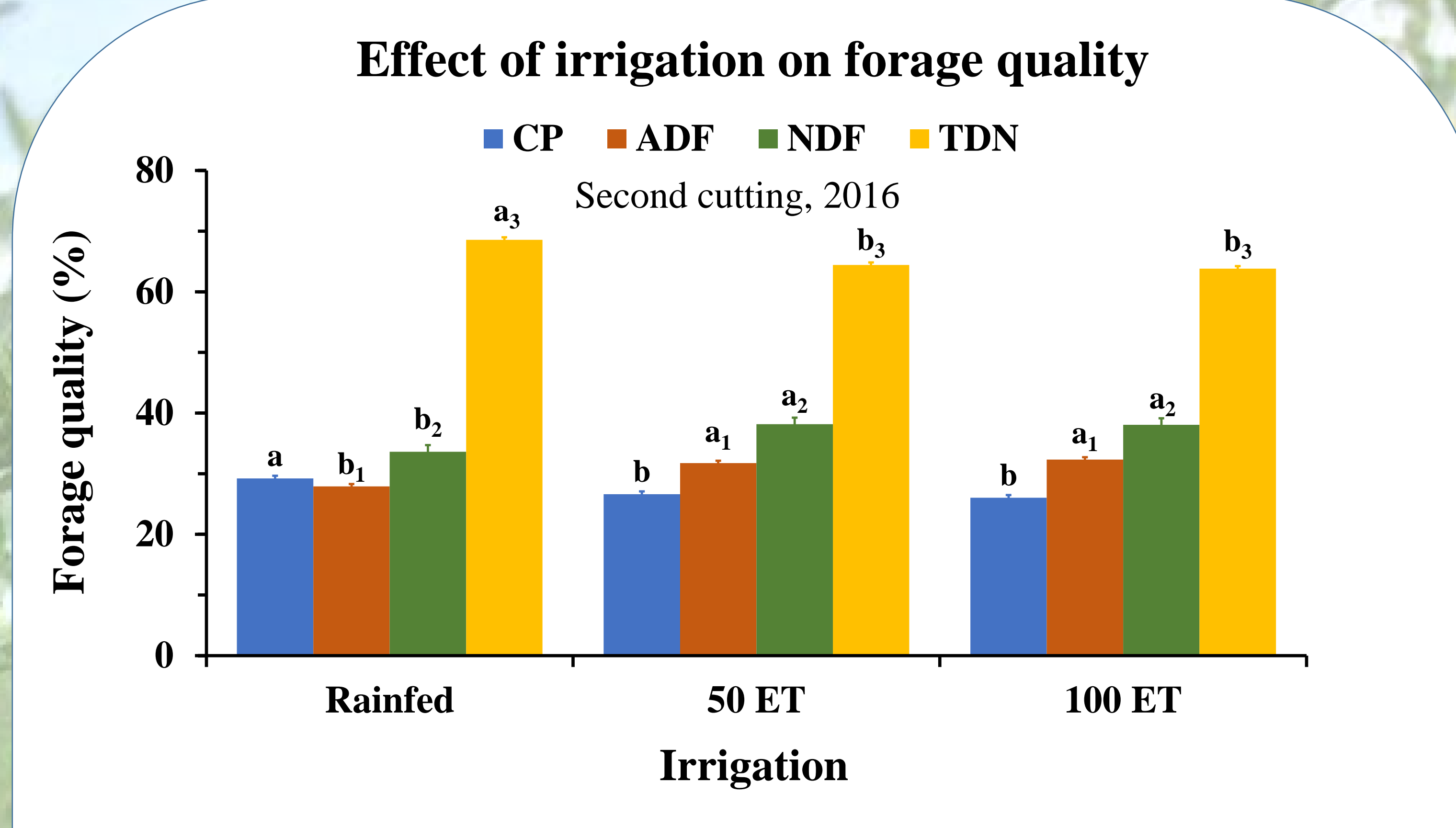
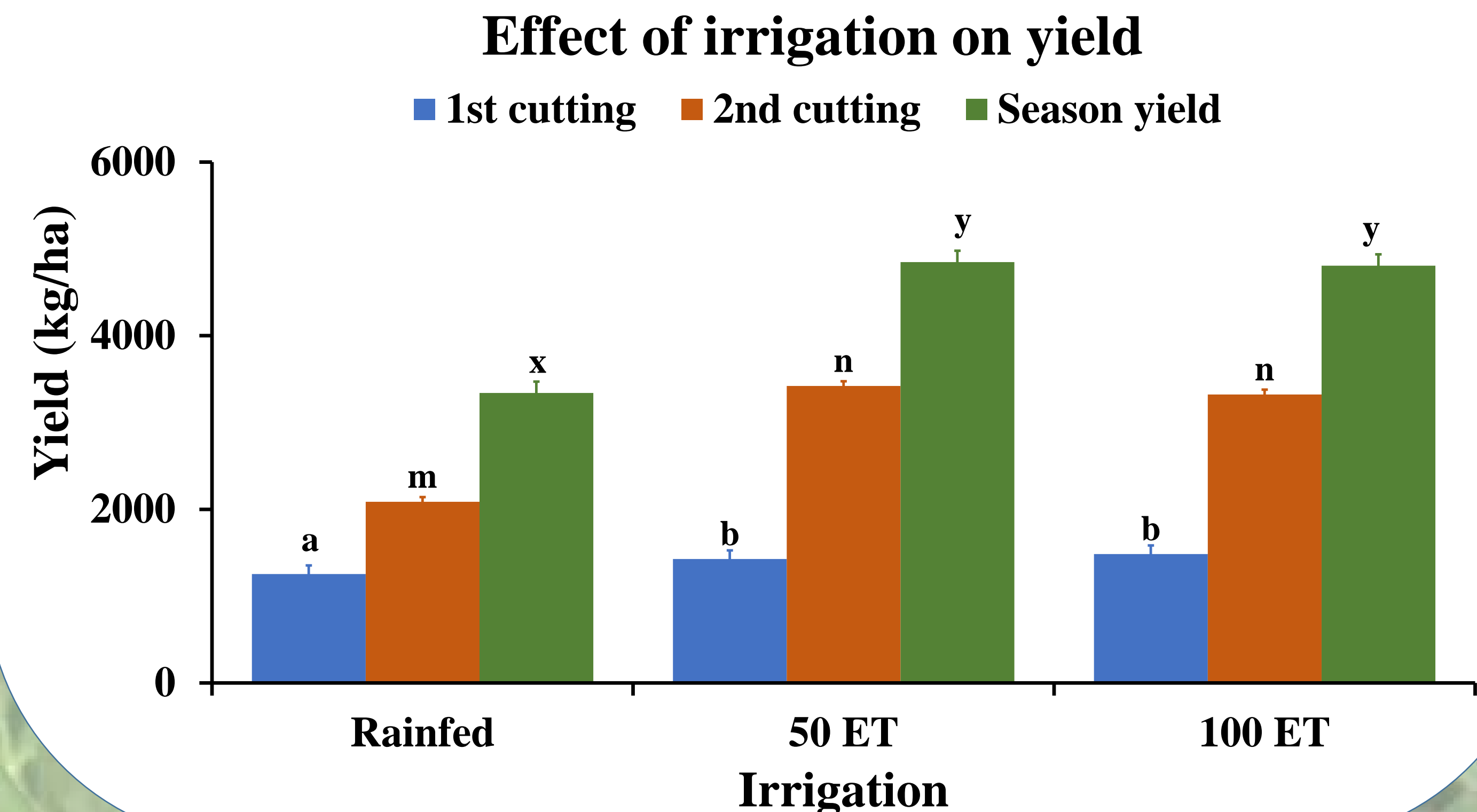
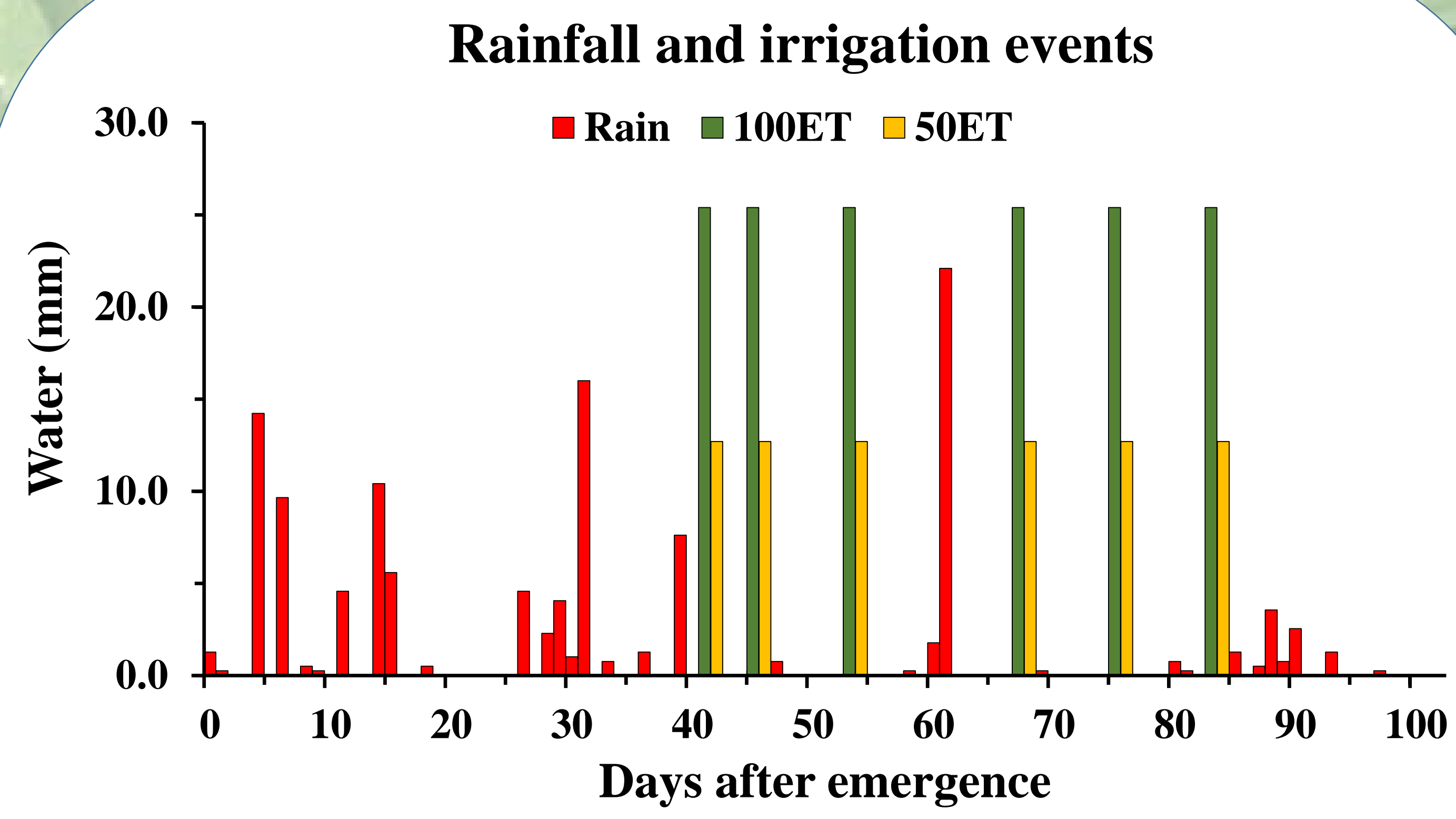
Abstract

Alfalfa (*Medicago sativa* L.) is a high water-use crop that has the highest boron (B) demand among many commercially-grown crops. Many soils in the state of Montana have potential to be deficient in B which can have significant impacts on alfalfa yield and quality; however, this has yet to be determined. This study was conducted to determine whether the yield and forage quality would be effected by irrigation and B fertilization. The research was done at Creston, MT on a fine sandy loam soil. Three irrigation treatments were determined using crop evapotranspiration (ET; rainfed check, 50ET, and 100ET) as the main plot and five levels of B (0, 0.28, 0.56, 1.12 and 2.24 kg ha⁻¹) as subplot laid in a split plot experimental design and replicated four times. Dry matter yield was increased up to 45% because of irrigation and demonstrated that a less than sufficient irrigation applied (50ET) was not inferior in relation to 100ET. A positive impact of B on yield was not observed. An inconsistent effect of B and irrigation were found on forage quality but the overall forage quality obtained from all of the treatments was of very good quality. Irrigating alfalfa with just 50% of the water required by the plant may increase the yield compared to a no-irrigation check. A second-year study will help to determine whether or not B is critical to a specific water regime in alfalfa production.

Materials and Methods



Results and Discussion



Conclusions and Implication

- Preliminary results shows that deficit irrigation (50ET) did not impact yield in relation to 100ET
- An inconsistent effect of B and irrigation were found on forage quality but the overall forage quality obtained from all of treatments was of very good quality
- Second-year study of B x irrigation regime association will help to determine whether or not B is critical to a specific water regime and alfalfa production in Montana
- Alfalfa yield may significantly increase in Montana, if irrigated

Acknowledgements

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Introduction and Objective

- Is known for its high dry matter yield and forage quality (Dordas, 2006)
- Yield increases with increase in water application (Donovan & Meek, 1983)
- Has the highest B demand among many crops (Rathore, 2015)
- Boron fertilization for alfalfa has not been specifically evaluated under Montana conditions
- To improve alfalfa production and forage quality, strategic B fertilization and irrigation strategy needs to be determined for various soils and environmental conditions in Montana

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 nutrient (TDN) and relative feed value (RFV)

References:

Donovan, T. J., & Meek, B. D. (1983). Alfalfa responses to irrigation treatment and environment. *Agronomy Journal*, 75(3), 461-464

Dordas, C. (2006). Foliar boron application improves seed set, seed yield, and seed quality of alfalfa. *Agronomy Journal*, 98(4), 907-913

Rathore, A., (2015). Boron: An important element for agricultural productivity. *Asian J. of Multidisciplinary Studies*, 3(2), 26-28