

Montana Fertilizer Advisory Committee (MFAC)

Project Title:

2023 Nitrogen Requirement for Sustained Yield and Optimal Quality of Cool-season Perennial Forages

Objective:

To test for nitrogen requirement, yield, and quality of selected cool-season perennial grass forages.

Personnel:

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Summary:

Cool-season perennial grasses were planted on April 21st, 2022, see table 1 for details. This study was under split-plot design where four N levels were the main plots (Table 2) and four forage species (Table 3) subplots. Both years were irrigated using center pivot irrigation. In 2023, 5.5 inches were applied.

In 2023, the average forage yields were higher than first-year establishment (Figure 1; Table 3). Twice-applied 50 lbs of N had 12% higher yield compared to the other N treatments. Tall fescue had the highest forage yield both in 2022 and 2023 (Table 3). At each cutting, tall fescue had the greatest nitrate levels compared to the other forage species but nitrate levels were under 200 ppm (Figure 2).

Table 1. Management Information

Seeding date:	April 21st, 2022 (111 Julian)	Field Location:	R3
Seeding rate:	Variety Dependent	Harvest dates:	See Below
Previous crop:	Canola	Soil type:	Creston Silt Loam
Herbicide:	Detonate, Cleaver (6/7/2022)	Tillage:	Conventional
Insecticide:	N/A	Soil residual nutrient: (NO₃-, P, K lb/A):	40-14-260 (2022)
Fungicide:	N/A	Nutrient fertilizer applied: (N, P₂O₅, K₂O lb/A):	Varied - 20.2 - 14.9 (Fall, 2022)

Harvest Dates:

Cut 1: Meadow Brome 5/23/2023, Smooth Brome & Dryland Mix 5/30/2023, Tall Fescue 6/5/2023 (Julian 143, 150, & 156)

Cut 2: All varieties of reps 1 & 2; 9/12/2023, all varieties of reps 3 & 4; 9/13/2023 (Julian 255 & 256)

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Table 2. Fertilizer treatments

N Treatment application only in 2022 with no application in 2023
Control
50 lbs N at planting
25 lbs N at tiller + 25 lbs N after 1 st cut
50 lbs N at tiller + 50 lbs N after 1 st cut

Table 3. 2022 & 2023 yield comparison. Same letter denotes insignificant different between species within year at $\alpha=0.05$.

Species	Forage, tons/Ac	
	2022	2023
Dryland mix (Barricade: meadow and smooth brome, tall fescue, intermediate grass)	1.38b	6.5a
Meadow brome (Arsenal var: drought tolerant)	1.55a	6.0b
Smooth brome (Artillery var: drought tolerant, suitable in cold reg.)	1.25b	5.1c
Tall fescue (STF-43 var: adaptive in dry and wet conditions)	1.65a	6.7a

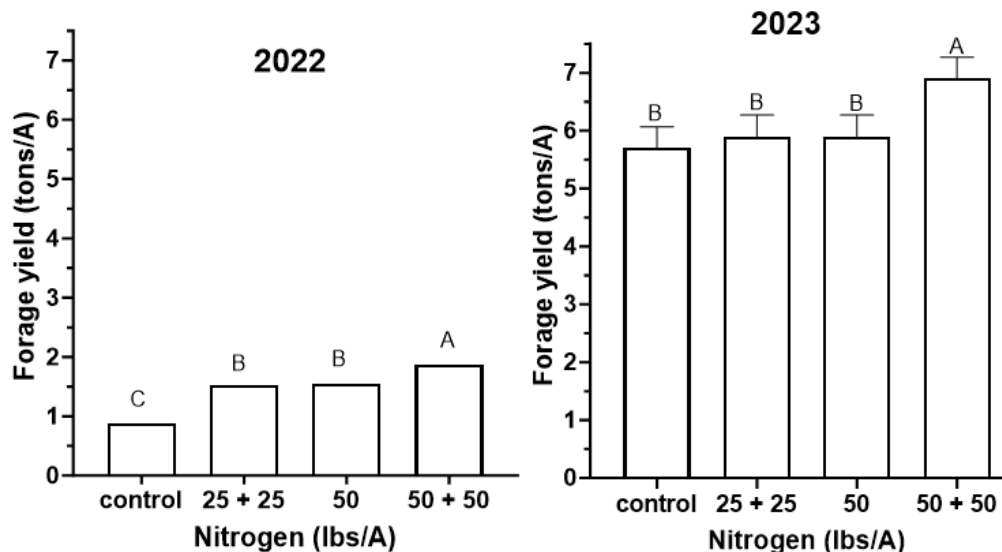


Figure 1. Yearly total forage yield under irrigation, Creston, MT. In 2022, the study was irrigated with 2.75 inches, whereas in 2023, 5.5 inches of irrigation was applied. The assignment of different letters denotes non-significance (ns) at $\alpha=0.05$.

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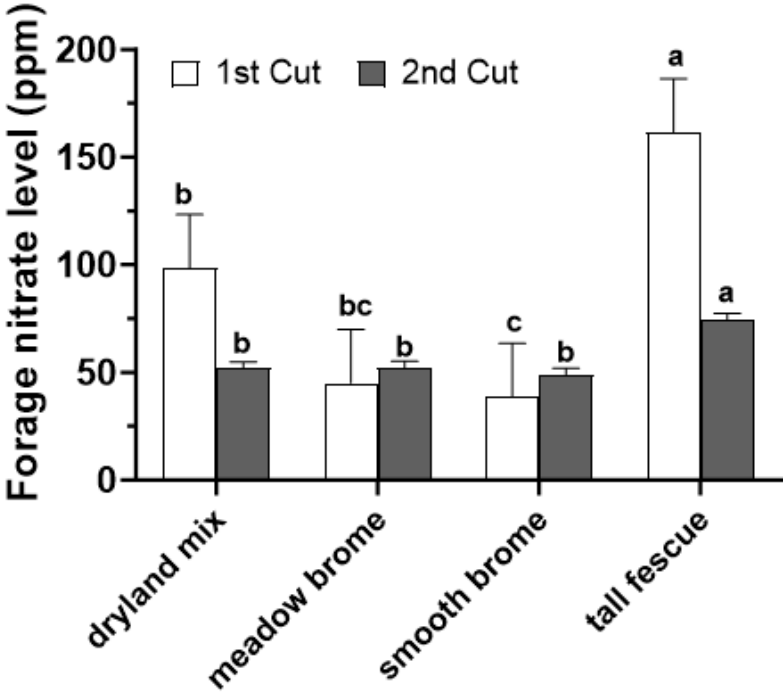


Figure 2. Forage nitrate levels under irrigation, Creston, MT. The assignment of different letters denotes non-significance (ns) within cuttings at $\alpha = 0.05$.