Wheat yield, soil mineral nitrogen and moisture interactions as affected by nitrogen fertilizer management

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Rationale

Improving nitrogen use efficiency (NUE) for cereal production is essential given the economic and environmental implications. In this study, two contrasting nitrogen management were evaluated for the same crop rotation and measuring in-season soil mineral nitrogen and soil moisture content in a wheat crop.

Objective

The main objective was to evaluate yield and partial factor productivity (NUE) in the two contrasting nitrogen management and to analyze the interaction between soil moisture content and soil mineral nitrogen.

Materials and Methods

The study was conducted in 2022 growing season, in Ashland Bottoms, Kansas.

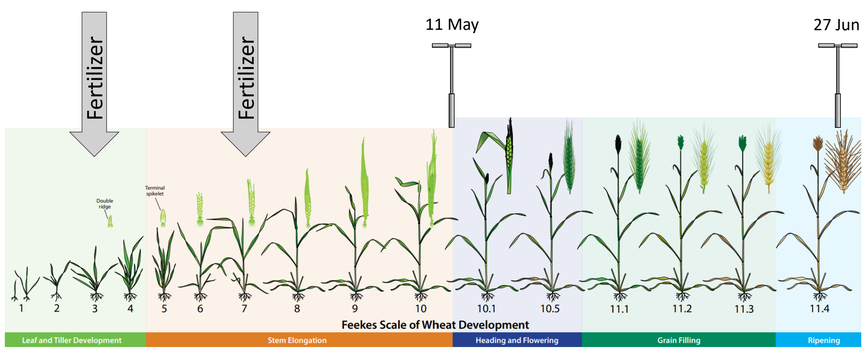
Rotation: Wheat - Sorghum - Soybean - **Wheat**

Fertilization	Treatment	
	Normal	**Progressive**
Time	Feekes 3	Feekes 3 + Feekes 7
Placement	Broadcast	Dribble
Source	UAN	UAN + Agrotain + Centuro
Rate	80 lbs/a	Feekes 3: 40 lbs/a Feekes 7: 27* lbs/a 67 lbs/a

*variable rate

Soils samples were collected at three depths: 0-6, 0-12, and 12-24 in.

Fertilizer application and soil sampling time



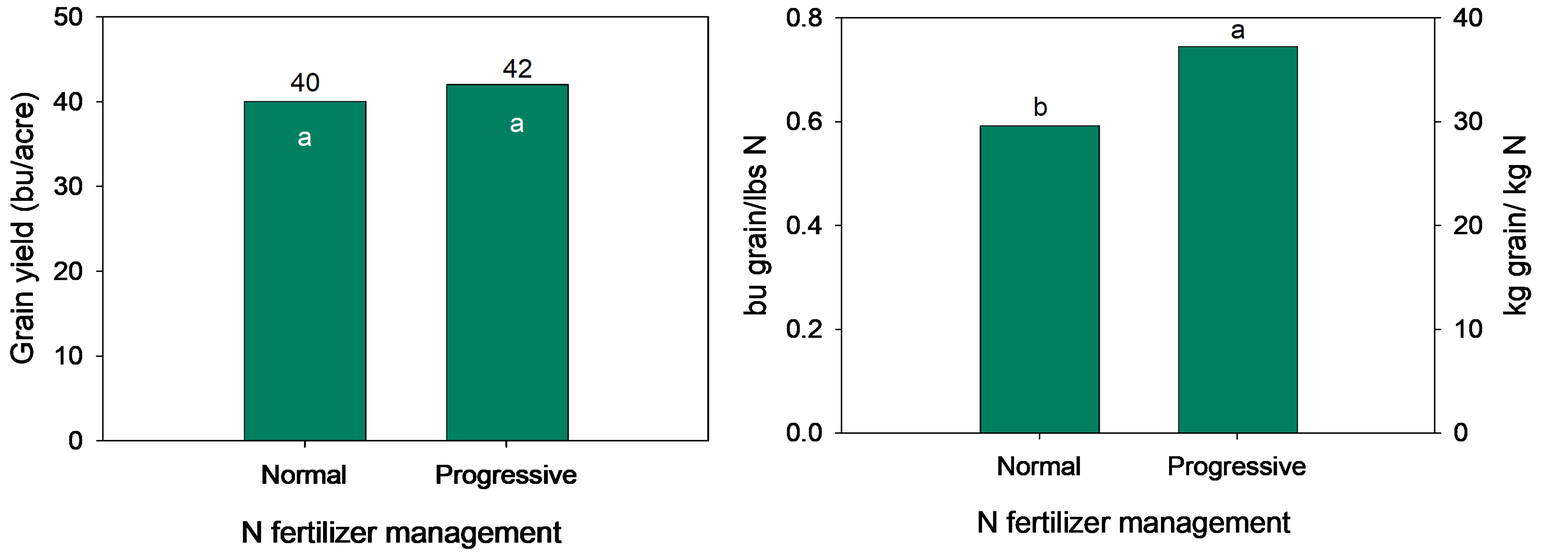


Figure 1. Wheat grain yield and NUE (partial factor productivity)

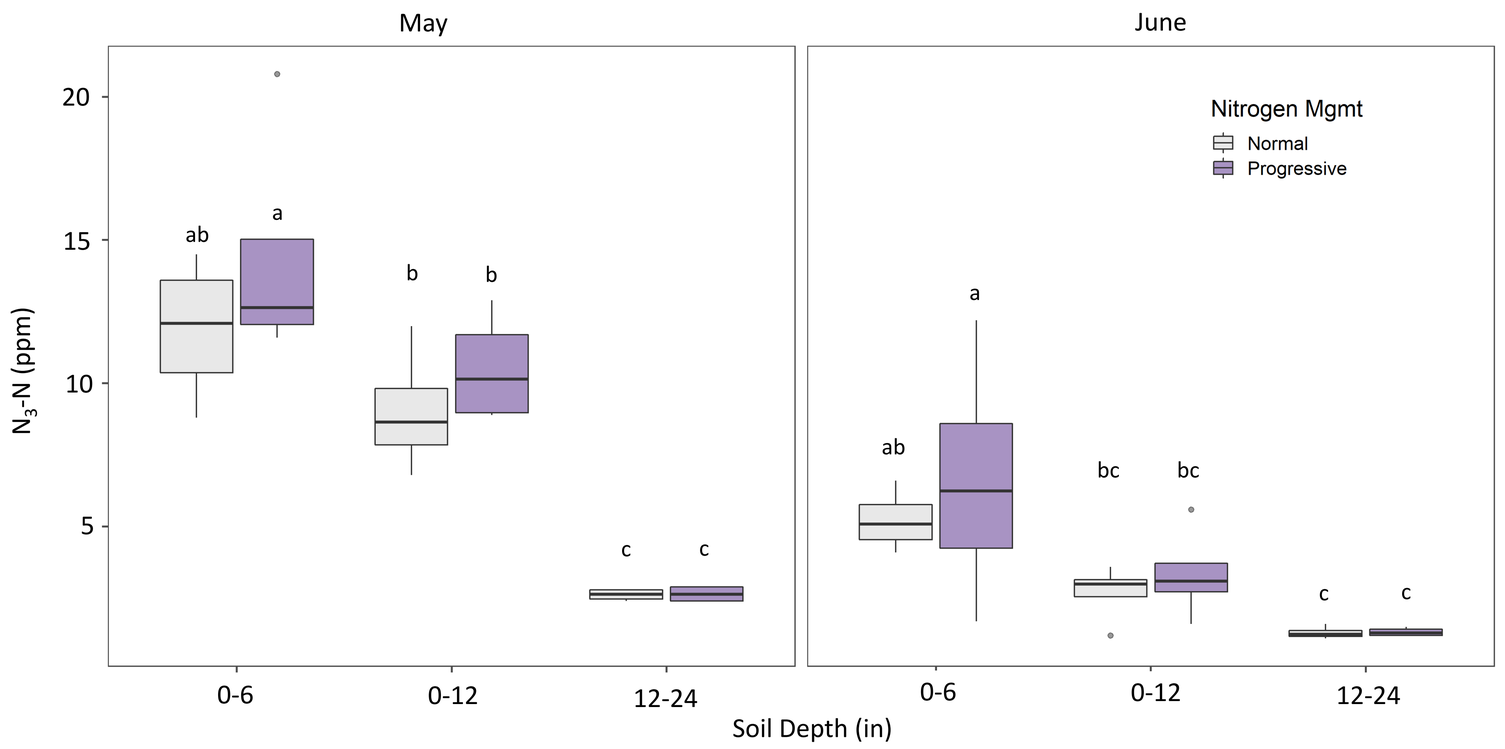


Figure 2. Soil NO_3-N at three depths and two dates for the normal and progressive N fertilizer treatment

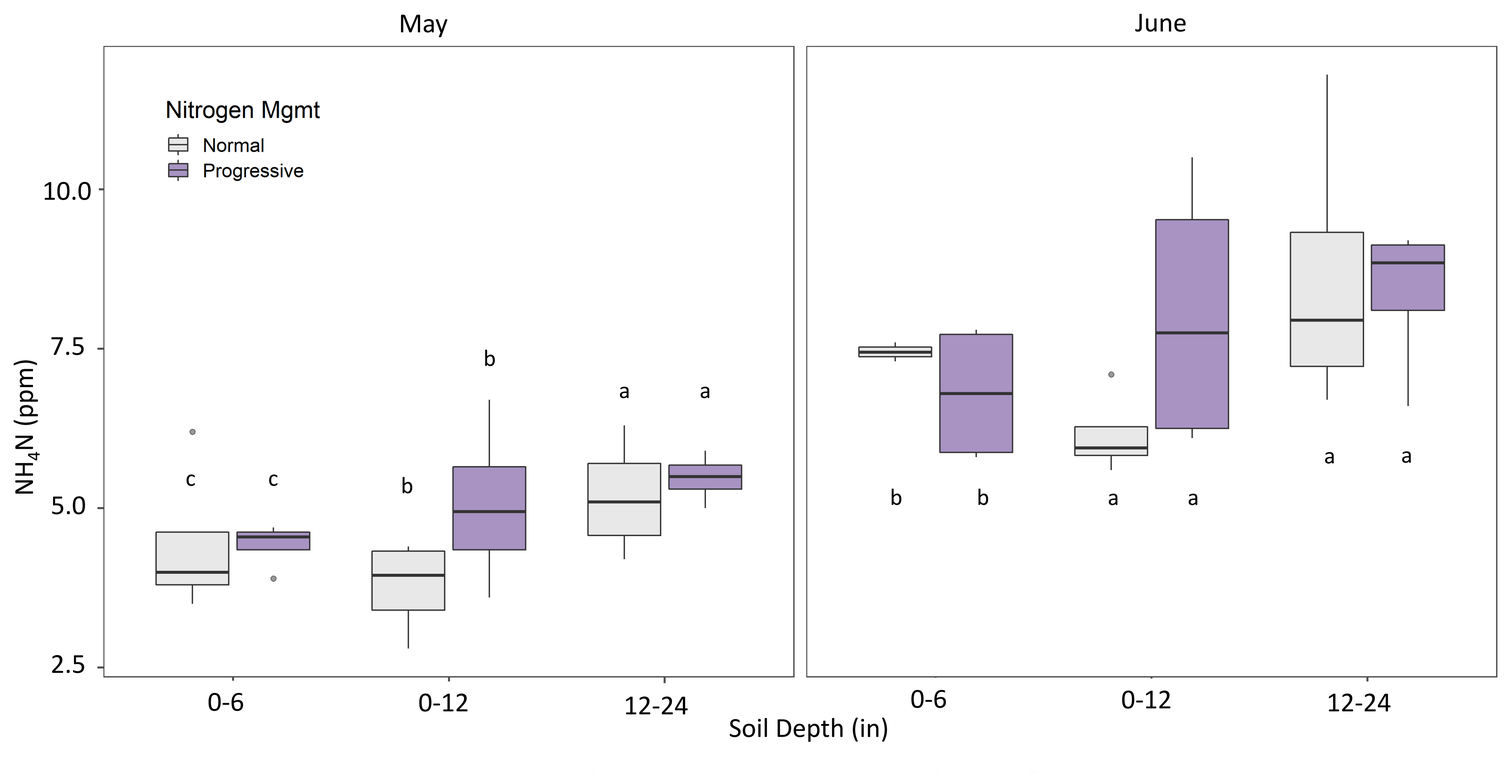


Figure 4. Soil moisture content at three depths and two dates, for normal and progressive N fertilizer treatment

Summary

- In 2022, there was no significant yield difference between the two nitrogen management, but there was a positive trend.
- With the lower N rate applied with the progressive treatment, the partial factor productivity (NUE) was 37 Kg grain/Kg N, compared to 30 Kg grain/Kg N in the normal N management.
- There was no statistically significant difference in soil moisture comparing the different nitrogen management nor in soil NO3-N content. However, there was a positive trend in the NO3-N content.
- In conclusion, adjusting the rate, time, placement, and source of nitrogen fertilizer can result in higher efficiency; in our study, yields were maintained but with lower N fertilizer application.

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RAIN Rainfed Agriculture Innovation Network
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