Winter cereal cover crops as an alternative forage source for extended season grazing

Katrina Kratzke[1], Joshua Wianecki[1], Miranda Meehan[1], Kevin Sedivec[1,2], Lindsay Chamberlain Malone[1] and Zachary Carlson[3]

Winter cereal cover crops are a high-quality forage source for extended season grazing. Rye has superior winter hardiness and produces greater early-spring biomass when planted late in the fall compared to triticale and wheat.

Summary

Winter cereal cover crops are increasingly used for their ecological benefits and are a potential forage source for livestock. This study evaluated winter rye, triticale and wheat cover crops as alternative forage sources for extended season grazing of beef heifers. Triticale provided the highest quality forage but insufficient biomass to support grazing. Rye had superior winter hardiness and biomass production compared to triticale and wheat. Grazing was heavily dependent on planting date, temperature and precipitation.

Introduction

Cover crops have gained popularity as a practice implemented across the United States. Producers are incorporating cover crops to improve soil health, increase crop yields, reduce soil erosion, manage water and increase forage options for livestock (CTIC 2025). Cereal rye, also called winter rye, is the most frequently grown cover crop, with the winter cereals of wheat and triticale also being common. Winter cereals are typically planted in the fall following a cash crop. They will initiate growth in the fall, undergo vernalization in the winter and transition to reproductive growth in the spring. Winter cereal cover crops provide ecological benefits such as protecting organic matter, enhancing soil pore development, reducing erosion and lowering nitrate concentrations in runoff. Economic returns from these ecological benefits are slow and difficult to track. Incorporating livestock may provide additional economic benefits while adding additional soil benefits (Kumar et al., 2019). In recent years, producers have expressed increased interest in livestock integration. The 2024-25 National Cover Crop Survey revealed 32.2% of crop advisors surveyed anticipate they will start to see more cover crops being grazed (CTIC, SARE and ASTA, 2025).

Dual-purpose CC practices often use winter cereals, such as rye or triticale, planted in the fall and then used for spring grazing (Drewnoski et al., 2018). Winter rye is commonly selected due to its winter hardiness, high biomass production and low cost. However, triticale and select winter wheat varieties produce higher-quality forage (Sedivec et al., 2021). Due to the short growing season in the northern Great Plains, it can be difficult to establish a cover crop as part of a dual crop system. In other regions, these species are dual-harvested (fall and spring) with grazing in addition to a cash crop. Currently, there is limited research evaluating the potential to dual graze a winter cereal for livestock forage in the northern Great Plains and assessing the economic and ecological benefits of integrated crop-livestock systems.

The objective of this study was to determine the impacts of long-term livestock integration and cover crop management on crop production, soil health and system profitability. This project compared management of winter rye, triticale and wheat cover crops and livestock integration through dual season (fall and spring) grazing, spring grazing, no grazing or no cover crop. The study evaluated cover crop production by biomass and nutritional value, as well as livestock performance in terms of grazing days.

Procedures (materials and methods)

A 40-acre site at the NDSU Central Grasslands Research Extension Center was selected. The site was divided into nine paddocks and randomly assigned one of three grazing treatments: dual season (fall

[1]School of Natural Resource Sciences, North Dakota State University, Fargo, ND.
[2]Central Grasslands Research Extension Center, North Dakota State University, Streeter, ND.
[3]IFF, Fargo, ND.

and spring) grazing (DG), spring grazing (SG) or no grazing (NG). The NG plots included a split-plot no-cover-crop (NCC) treatment. Treatments were established in fall 2022, and the site was converted to no-till management (Wianecki, 2025). In 2024 and 2025, cover crop treatments were subdivided into winter rye (*Secale cereale* L.), triticale (*x Triticosecale* Wittmack) and winter wheat (*Triticum aestivum* L.).

Prior to and following every grazing period, cover crop biomass samples were collected to determine production, set stocking rates and evaluate utilization; cattle's two-day weights were also recorded. Four 0.82 ft^2 frames were clipped to ground level per winter cereal per plot. Forage samples were dried at 122 degrees Fahrenheit for 48 hours and weighed to determine biomass production. Samples were ground to 2 mm and submitted to the North Dakota State University Nutrition Laboratory (Fargo, North Dakota) for analysis of crude protein (CP), total minerals (Ash), neutral detergent fiber (NDF), acid detergent fiber (ADF), in vitro organic matter digestibility (IVOMD) and in vitro dry matter digestibility (IVDMD). Forage biomass samples were not collected in fall 2025 due to limited growth. Nutritional analyses were not conducted in spring 2026 due to inadequate sample size.

Winter cereals were grazed spring of 2025 at 0.13 AUM ac^{-1} and in the fall at 1.06 AUM ac^{-1}. In fall 2025, cows were additionally provided liquid protein supplement due to low nutritional value of corn stalk residue and lack of winter cereal biomass. In spring 2026, there was no grazing period due to insufficient forage production.

All statistical differences were determined by analysis of variance (ANOVA) within R v4.6.0 using the aov() function. Fixed effects included grazing period, treatment, cereal type and all associated interactions. Comparison of means was performed using Tukey's HSD through the emmeans() package (Lenth, 2024). Significance was determined at $P \leq 0.05$.

Results and Discussion

In spring of 2025, cover crop biomass production varied by treatment and cereal type (Figure 1). Pre grazing, SG rye produced greater biomass than triticale and wheat. The NG rye produced greater biomass than grazed rye, grazed and NG triticale, and wheat. There were no post grazing differences between DG and SG, as treatments were grazed at the same stocking rates to achieve the same level of utilization. In 2026, rye produced greater biomass than triticale and wheat (Figure 2). Triticale and wheat did not start growing as early or quickly as rye.

Nutritional analysis of winter cereals was completed in spring 2025 (Table 1). Triticale had lower NDF and ADF than wheat and rye. Rye had lower CP than triticale. Wheat had lower IVDMD and IVOMD than rye and triticale. This indicates that triticale had the highest forage quality, while winter wheat had the lowest. Rye was intermediate quality but produced the greatest biomass. This is consistent with the findings of Sedivec (2021). Winter kill was observed in the wheat and

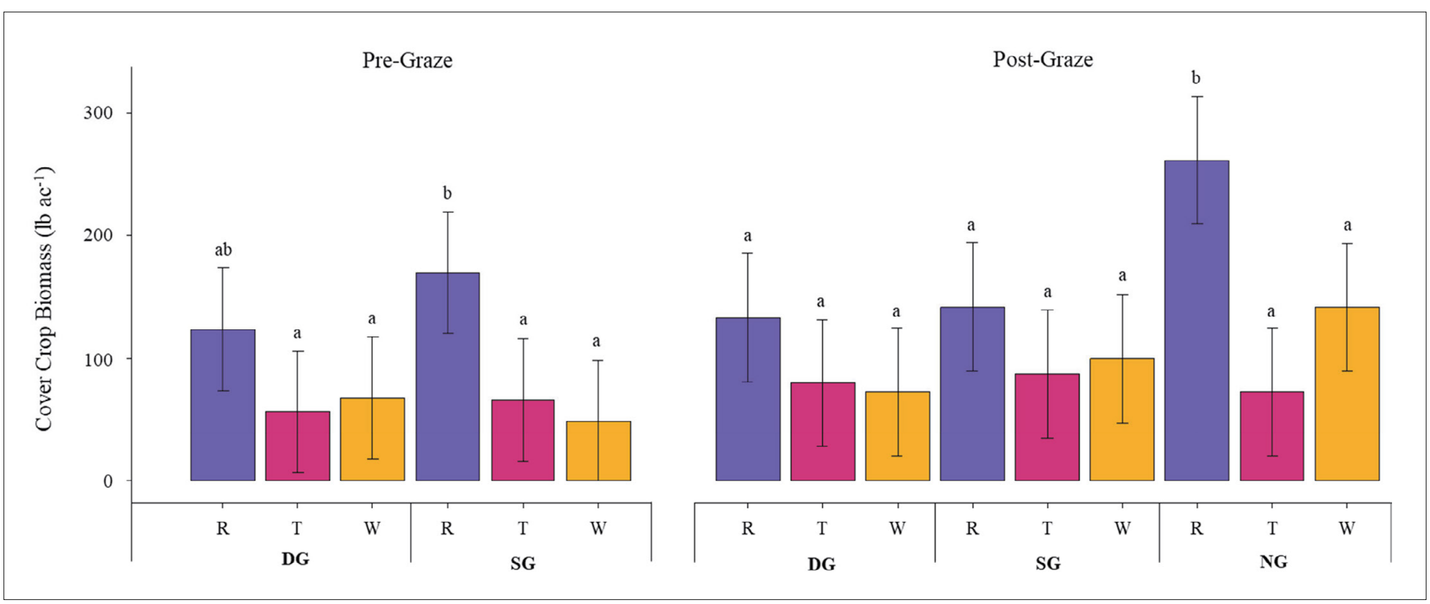

Figure 1. Spring 2025 winter cereal biomass production.
[abc] Means not connected by the same letters are significantly different within grazing period ($P \leq 0.05$).

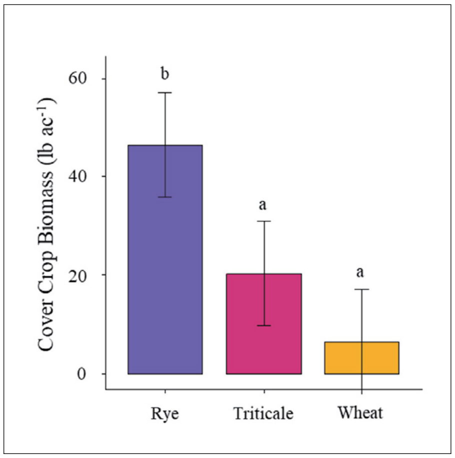

Figure 2. Spring 2026 winter cereal biomass production.

[abc] Means not connected by the same letters are significantly different within grazing period (*P* ≤0.05).

triticale, along with a delay in spring emergence compared to rye, resulting in differences in growth at sampling. Post graze forage was lower in IVDMD than pre graze forage. This is expected, as forage continues to grow and mature; digestibility typically decreases.

Average daily gain (ADG) for 2025 spring graze was -2.55lbs day^{-1}, and fall graze was -3.58lbs day^{-1}. Although the nutritional value of forage was high, these short grazing periods resulted in a loss of gain. This can be attributed to the grazing periods of less than two weeks, which do not allow adequate time for livestock to adjust to the new diet. Drewnoski (2018) reported fall-weaned calves that grazed a fall cover crop for a 48–64-day period had an ADG of 1.32 to 2.43 lbs.

Grazing cover crops is heavily dependent on planting date, temperature and precipitation but can provide a high-quality forage source. Of the three winter cereals evaluated, triticale produced the highest quality forage but insufficient biomass to support grazing. If planting a cover crop late in the fall, we recommend using winter rye, as it produces the greatest spring biomass to support a short grazing period.

Acknowledgments

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Table 1. 2025 winter cereal nutirional analysis results pre- and post-grazing

Period	Trt	Cereal	Ash%	NDF%	ADF%	CP%	IVDMD%	IVOMD %
Pre-Graze	DG	Rye	13.307	46.084	23.171	18.024	80.447	80.800
		Triticale	14.056	43.321	21.994	18.909	81.567	81.927
		Wheat	17.657	49.680	29.364	16.932	64.986	66.873
	SG	Rye	13.329	50.394	26.798	13.302	77.329	77.818
		Triticale	10.706	46.801	22.406	16.162	84.012	83.212
		Wheat	14.771	49.376	28.064	17.738	72.957	73.032
Post-Graze	DG	Rye	28.000	58.074	35.151	15.068	66.990	75.321
		Triticale	18.186	47.014	25.813	23.873	75.613	79.303
		Wheat	23.328	50.450	29.740	21.564	60.669	68.540
	NG	Rye	10.435	51.047	25.810	17.975	78.529	78.970
		Triticale	14.032	NaN	NaN	30.630	83.512	85.005
		Wheat	28.164	50.931	31.839	22.535	65.310	74.261
	SG	Rye	27.914	54.460	32.561	15.505	66.781	75.182
		Triticale	19.468	46.562	23.642	25.325	75.341	78.726
		Wheat	25.121	57.315	33.886	19.272	59.949	72.485
	***P*-value**	**Period**	**≤ 0.001***	**0.002***	**0.010***	**0.053**	**0.003***	**0.187**
		Trt	**0.244**	**0.375**	**0.207**	**0.153**	**0.012**	**0.066**
		Cereal	**0.210**	**0.015***	**0.024***	**0.005***	**0.001***	**≤ 0.001***
		Period*Trt	**0.717**	**0.183**	**0.386**	**0.277**	**0.899**	**0.733**
		Period*Cereal	**0.353**	**0.1 62**	**0.372**	**0.083**	**0.777**	**0.342**
		Trt*Cereal	**0.205**	**0.915**	**0.402**	**0.921**	**0.705**	**0.407**
		Period*Trt*Cereal	**0.891**	**0.105**	**0.361**	**0.554**	**0.554**	**0.653**

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