Cereal Rye, Winter Triticale or Winter Wheat

Which is Best for Early Spring Grazing?

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Summary with Implications

A study was conducted to determine which winter-hardy small cereal grain was best suited for early spring grazing. Three species were evaluated: winter wheat, cereal rye, and winter triticale, as a double-cropped forage in a continuous soybean rotation. Within this rotation the number of grazing days is limited, but all three species provided high rates of cattle weight gain, with an average daily gain (ADG) of 3 lb/d in April. However, in a year where freezing conditions occurring after cattle started grazing, cattle grazing cereal rye had the greatest ADG, likely due to greater forage growth. Thus, cereal rye may be a better choice if early spring grazing is the goal.

Introduction

The most common crop rotation used throughout much of the Midwest is a corn-soybean rotation. However, this rotation is not well-suited to double-cropping. Continuous soybean is not a common practice in eastern Nebraska, but the timing of soybean harvest lends itself to the incorporation of double-cropped forages. A disadvantage to continuous soybean is minimal residue coverage that can leave soils prone to erosion and nutrient loss. Adding winter annual, small grain forages after soybean can provide additional ground cover and provide supplemental forage and grazing opportunities. Winter wheat (*Triticum aestivum* L.), cereal rye (*Secale cereale* L.), and winter triticale (x *Triticosecale* Wittm. ex A. Camus) are the most common winter annual, small grain forages used for grazing in early spring. The objective of this study was to evaluate early spring grazing potential and animal performance of these species when used as a double-cropped forage in a continuous soybean rotation in eastern Nebraska.

Procedure

In this three-year study (year 1: 2019–2020, year 2: 2020–2021, year 3: 2021–2022), an 18-acre field was managed under a dryland, continuous no-till soybean system. A short-season variety (Group 1) soybean was planted in 30-inch row spacing. Soybeans are legumes that fix nitrogen in the soil, so no fertilizer was applied under the assumption that the soybean crop provided enough nitrogen for the small-cereal grains. After soybean harvest, the field was divided into nine 2-acre pastures where cereal rye, winter triticale, and winter wheat were each planted in 3 of the pastures. Small cereals were drilled in 7-inch spacing after soybean harvest with seeding rates of winter wheat 102 lb/ac pure live seed (PLS), cereal rye 88 lb/ac PLS, and winter triticale 108 lb/ac PLS. Year 1 and 2 used Pronghorn winter wheat, variety not stated (VNS) cereal rye, and NT11406 variety of winter triticale. In year 3, the same wheat and triticale varieties were used, but Rymin rye was used instead of VNS. The small cereals were planted on September 15th, September 22nd, and September 22nd in years 1, 2, and 3, respectively.

Growing steers were stratified by weight and assigned to 1 of 9 groups which were then randomly assigned to pasture. The average initial body weight of the steers was 673, 785, and 827 lb in year 1, 2, and 3, respectively. They were stocked at a density of 3 head/acre in year 1 and year 2, and at 2.5 head/acre in year 3 due to heavier steers and lack of precipitation. The 2-acre pastures were divided into two 1-acre paddocks that were rotationally grazed by their assigned group. Cattle were turned out when forage height reached 5-inches, and grazed paddocks until forage height was around 2-inches then were rotated to the other half of the pasture. Pre and post graze biomass samples were cut by hand at ground level from 4 locations in each paddock at each rotation to calculate forage yield.

A timeline of the grazing period in each year is shown in figure 1. In year 1, cereal rye treatments were turned out first on April 3rd, followed by wheat and triticale treatments on April 9th. Two of the three groups of steers grazing rye were removed on April 29th, due to limited forage availability and the remaining groups were removed May 8th to allow for planting of soybeans. This resulted in all three species having a grazing period of 29 days in year 1. In year 2, all treatments were turned out on April 6th. Some groups of cattle were pulled on April 21st, and the remaining were pulled on April 27th due to limited biomass, this resulted in 17, 18, and 19 grazing days for triticale, wheat, and rye, respectively. In year 3, all groups were turned out on April 12th and then removed on April 21st due to limited biomass. Cattle were returned to grazing on April 27th and then all groups were removed on May 6th due to limited biomass. All three species had 18 grazing days in year 3.

This was a completely randomized design where pasture was the experimental unit, and small cereal species was the treatment. There were 3 experimental units per treatment per year. Animal performance measures of average daily gain (ADG), gain per acre (GPA), and animal unit months per acre (AUM/acre) were analyzed using the MIXED procedure of SAS. Fixed effects were treatment, year, and interaction of treatment x year. Pre- and post- graze biomass were analyzed in SAS with rotation within year as a repeated measure. A P-value of ≤ 0.05 was considered significant.

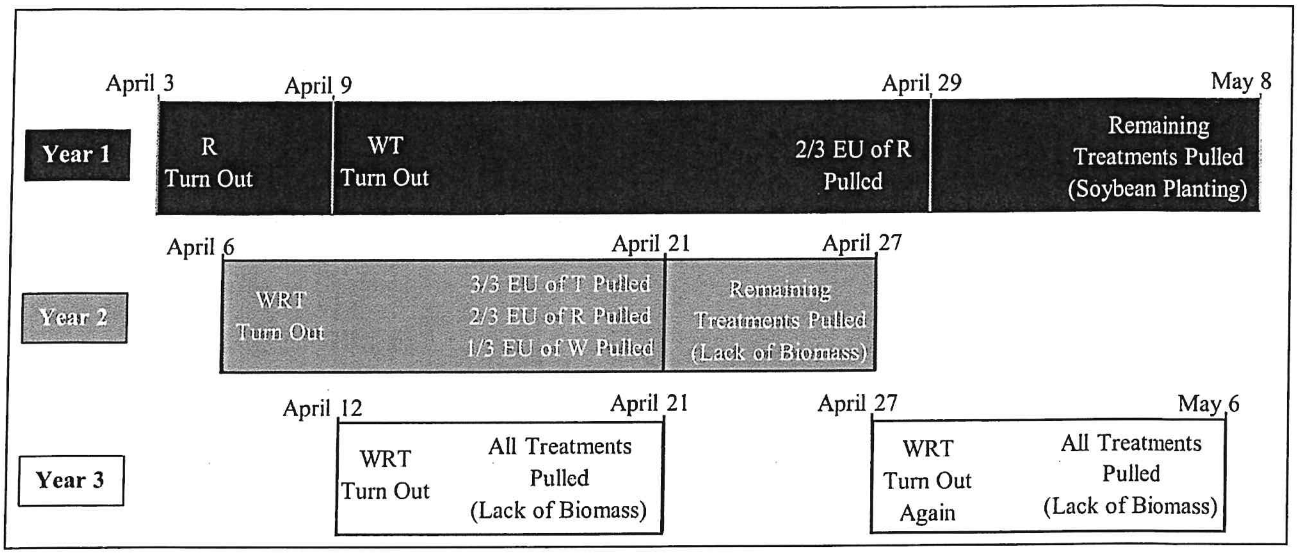

Fig. 1. Timeline of grazing winter wheat (W), cereal rye (R) and winter triticale (T) in early spring over a three-year period. For each year, the bar represents the amount of grazing provided. In years 1 and 2, 6 steers were stocked per 2 ac paddock and in year 3, 5 steers were stocked per paddock. In years 2 and 3, steers were removed early due to insufficient forage.

Table 1. Effect of treatment on forage growth and grazing performance of grazing steers when grazing winter wheat, winter triticale and cereal rye in early spring.

	Treatment				
	Wheat	Rye	Triticale	SEM	Treatment *P*-value
Initial body weight, lb	740	744	742	1.58	0.21
End body weight, lb	806	814	804	3.91	0.21
Pre-grazed biomass, lb/ac	649	761	754	45.9	0.20
Post-grazed biomass, lb/ac	244^b	413^a	268^b	48.8	0.05
Carrying capacity, AUM/ac[1]	1.42	1.43	1.42	0.043	0.99
Gain, lb/ac	187	199	179	8.29	0.26

^{abc} means lacking common letters within row differ ($P \leq 0.05$)

[1] AUM = animal unit month; equal to a 1,000 lb animal grazing for 30.5 days

Table 2. Effect of year on forage growth and grazing performance of growing steers when grazing winter wheat, winter triticale and cereal rye in early spring.

	Year				
	1	2	3	SEM	Year *P*-value
Initial body weight, lb	668^c	737^b	820^a	1.58	<0.01
End body weight, lb	784^b	766^c	874^a	3.91	<0.01
Pre-grazed biomass, lb/ac	1077^a	397^b	690^b	57.0	<0.01
Post-grazed biomass, lb/ac	471^a	153^c	301^b	57.4	<0.01
Carrying capacity, AUM/ac	2.07^a	0.96^c	1.25^b	0.043	<0.01
Gain, lb/ac	349^a	83^c	134^b	8.29	<0.01

$^{a-c}$ means lacking common letters within row differ ($P \leq 0.05$)

Results

Forage Yield

There was no treatment x year effect ($P > 0.10$) for pre-graze or post-graze biomass. There was also no treatment effect ($P = 0.20$) for pre-grazed biomass (Table 1). However, there was a year effect ($P < 0.01$) of pre-grazed biomass with year 1 having greater ($P < 0.01$) pre-graze biomass than years 2 and 3, and year 2 having less ($P < 0.01$) biomass than year 3 (Table 2). Year 2 was a cold, wet spring, and year 3 was a drought year in eastern Nebraska, so differences in biomass availability may be attributed to these conditions. There was a treatment effect ($P = 0.05$; Table 1) and a year effect ($P < 0.01$; Table 2) for post-graze biomass. Cereal rye had more ($P < 0.01$) post-graze biomass remaining compared to wheat and triticale which did not differ (Table 1). Year 1 had the most ($P < 0.01$) biomass left after grazing with year 2 having less ($P = 0.05$) biomass than in year 3 (Table 2).

Initial forage heights at turn out in year 1 were 4.3 inches for wheat, 4.7 inches for cereal rye, and 4.3 inches for triticale. In year 2, initial heights before turning out were 4.3 inches for wheat, 4.7 inches for cereal rye, and 4.7 inches for triticale. In year 3, initial turnout heights were 4.7 inches

Table 3. Species by year effect on average daily gain (lb/d) of growing steers when grazing winter hardy small cereals in early spring.

	Average Daily Gain, lb/d				
	Wheat	Rye	Triticale	SEM	Treatment x year *P*-value
Year 1	4.10[a]	3.93[a]	4.07[a]	0.267	0.03
Year 2	1.83[c]	3.07[b]	1.43[c]		
Year 3	2.93[b]	3.13[b]	2.90[b]		

[abc] means lacking common letters differ ($P \leq 0.05$)

for wheat, 5.1 inches for cereal rye, and 5.1 inches for triticale.

Cattle Performance

There were no treatment x year interactions ($P > 0.05$) or treatment effects for initial ($P = 0.21$) or end BW ($P = 0.21$; Table 1). However, there was a treatment x year interaction ($P = 0.03$) for average daily gain (Table 3). In year 1 and year 3, there were no differences ($P \geq 0.10$) among treatments. However, in year 2, steers grazing cereal rye had greater ADG ($P \leq 0.01$) than wheat and triticale which did not differ ($P = 0.31$). This treatment x year interaction of ADG is important to note because there is the potential that cereal rye may present an advantage under cold stress weather, which may provide an incentive to plant and graze it if early spring grazing is desired. In two out of three years, no species showed an advantage in cattle performance through ADG; however, in the extremely cold year when not much pre-graze biomass was present (397 lb/ac), cattle on cereal rye had ADG of 3.1 lb/d compared to 1.5 lb/d for triticale and 1.8 lb/d for wheat. Across all years, cereal rye had greater post-graze biomass than wheat and triticale. Given the low biomass in all species in year 2, the higher post-graze biomass in cereal rye may have allowed for greater cattle intakes. Although cattle grazing rye gained more in year 2, over all three years, all species provided high rates of gain, with average ADG for the species ranging from 2.8 lb/d to 3.4 lb/d, suggesting that vegetative winter hardy small cereals are high quality.

There were no differences ($P > 0.01$) among treatments for gain per acre (Table 1), but differences ($P < 0.01$) among years were found, with year 1 having the greatest ($P < 0.01$) gain per acre, year 2 the least ($P < 0.01$), and year 3 intermediate ($P < 0.01$; Table 2). Carrying capacity followed this pattern with no differences ($P = 0.99$) among treatments, but with year 1 having the greatest ($P < 0.01$) AUM per acre, year 2 having the least ($P < 0.01$), and year 3 being intermediate.

The general lack of differences between small cereal species' performance could be because these small cereals typically do not separate themselves in terms of yield early in the growing season, although differences may be found as forage matures. It is also important to note that in this trial, forage was maintained in an early vegetative state as cattle were rotated between paddocks. In years 2 and 3, cattle had to be pulled off early due to insufficient forage. The grazing season could have been extended if stocking density had been lowered. It is also interesting to note that as the cattle were rotated between paddocks, the forage recovered quickly and could grow 3 to 4 inches in a week. Trends in cattle performance within years were similar to trends in forage availability, suggesting that cattle performance could have been related to the amount of forage available.

Conclusion

These data show that winter wheat, cereal rye, and winter triticale can be used for early spring grazing as a double-cropped forage in a continuous soybean system in Eastern Nebraska to fill forage deficiencies for cattle producers. Minimal differences in early spring grazing potential and animal performance were observed across species, although cereal rye had an advantage when freezing conditions occurred after early spring turn out.

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