Evaluating Cover Crops and Summer Annual Forages for Beef Cattle–Year 3

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Annual forages can provide flexibility when managing forage supply by helping fill forage production gaps or serving as primary forage sources. The use of annual species for forage production potentially can help producers stretch feed supplies, extend grazing seasons, increase carrying capacity, and facilitate expansion. Annual forages can be incorporated into cropping systems as winter cover crops or as alternative crops planted during the growing season. Greater knowledge of potential yield and nutritional value of annual forage species will empower producers to make informed decisions about the use of annual forages. Additionally, demonstration of annual forage rotations may provide information regarding the overall sustainability of this alternative land use.

Consequently, a forage plot trial is being conducted to evaluate potential yield, nutritional value, forage crop nutrient removal, and economic sustainability of winter annual forages used in rotation with various summer annual forage species. This report summarizes year three of this four-year study.

Materials and Methods

Cereal rye, barley, triticale, winter wheat, and forage wheat were seeded with a no-till drill September 28, 2020, into 1,050 sq. ft. forage plots. Eight replicates of each species were seeded with half of the plots (four) receiving no nitrogen (N) and half receiving 50 lb. of N per acre. Samples were collected for nutritional analysis based on forage maturity, targeting the boot stage, in May 2021.

Random samples were collected by hand, cutting close to the ground surface to mimic grazing or mechanical harvest and collecting whole plant samples. Samples from replications of each species were pooled by species and by N treatment for a total of 10 samples, which were frozen until submission to a commercial laboratory for nutrient and quality analysis. Yield estimates were collected in May using a small forage harvester to cut a strip through the center of each plot. Forage weight and strip area (length x width) were used to calculate forage yield per acre. Additionally, using a dryer and by taking serial weights until the weight was no longer decreasing, farm staff measured moisture/dry matter at harvest by drying the sample and comparing final dry weight with initial wet weight. Winter annuals were harvested and on regrowth, were terminated with herbicide to prepare for planting the summer annual forage species.

Pearl millet, German millet, sorghum sudangrass, sudangrass, and teff were planted June 18, 2021. Eight replicates of each species were seeded with half of the plots (four) receiving no N fertilization and half receiving 50 lb. of N per acre July 2, 2021. Warm season annuals were sampled for nutritional analysis and yield August 8, 9 and September 22, 2021. Following harvest and termination of the 2021 warm-season forages, winter cover crops were again planted to overwinter and will be sampled in the spring of 2022.

Results and Discussion

A summary of the nutrient quality data is found in Table 1. At the time of sampling, most species were in the late vegetative stages to early reproductive stages of growth to mimic grazing or harvest for silage. In general, the forages contained adequate energy levels to support late-lactation or early-to-mid gestation requirements of a beef cow. Crude protein levels were less than expected and less than crude protein values in the previous year of the study. Reasons for lesser crude protein values are unclear.

Figure 1. Cool-season forage.

Forage yield results are found in Table 2, and as observed in previous years, nitrogen application resulted in approximately a 50% yield increase. This demonstrates that if producers are using annual forages as a forage source, nitrogen fertilization is advantageous.

To mimic real-world harvest and optimize both yield and quality, cool season species were sampled based on forage maturity with the boot stage as the target stage. Barley and cereal rye were sampled May 14, and triticale and the wheat varieties were sampled May 24. The later sample dates for the triticale and wheat species likely contributed to greater yields for these species.

Table 1. Forage nutritional profiles.[1]

		DM (%)	CP (%)	ADF (%)	NDF (%)	Ca (%)	P (%)	Mg (%)	K (%)	S (%)	RVF	TDN (%)	Neg Mcal/ cwt
Cool-season forage species	Barley	28.8	8.4	25.6	43.5	0.4	0.3	0.1	2.0	0.2	144.4	68.3	33.2
	Cereal rye	22.0	7.9	34.2	55.5	0.3	0.4	0.12	2.7	0.19	102.9	65.6	28.4
	Forage wheat	25.8	8.4	37.0	58.1	0.3	0.4	0.1	2.4	0.2	93.0	64.7	27
	Triticale	23.6	8.0	41.9	64.5	0.2	0.3	0.1	2.3	0.1	80	63.2	24.7
	Winter wheat	24.5	10.0	36.4	56.3	0.3	0.3	0.1	2.7	0.2	97.8	60.6	27.5
Warm-season forage species	Pearl millet	23.0	7.0	36.1	61.1	0.7	0.6	0.3	2.6	0.2	90.1	60.7	24.6
	German millet*	24.5	5.8	43.9	65.6	0.4	0.3	0.2	2.3	0.1	75.3	54.7	22.1
	Sorghum sudangrass*	25.5	5.1	33.8	59.4	0.5	0.4	0.2	1.8	0.2	94.6	62.6	24.4
	Sudangrass	23.3	7.0	31.7	57.2	0.5	0.4	0.3	2.0	0.1	101.8	64.2	26.2
	Teff	35.6	7.3	36.5	63.0	0.5	0.4	0.3	1.9	0.2	87.0	60.5	24.5

[1]DM = dry matter, CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, Ca = calcium, P =phosphorous, Mg = magnesium, K = potassium, S = sulfur, RVF = relative feed value, TDN = total digestible nutrients, NEg = net energy for gain.

[2]Warm-season values are averages of two cuttings taken in August and September 2021.

*German millet and sorghum sudangrass were not sampled in September.

Table 2. Forage yields in tons of dry matter per acre with and without N fertilizer.[1]

		0 N	50 N
Cool-season forage species[2] sampled May 2021	Barley	0.54	1.42
	Cereal rye	0.80	1.87
	Forage wheat	0.94	2.22
	Triticale	1.33	2.97
	Winter Wheat	0.6	2.57
Warm-season forage species sampled Aug. 8-9	Pearl millet	0.29	0.53
	German millet	0.85	1.87
	Sorghum sudangrass	0.43	0.99
	Sudangrass	0.72	1.19
	Teff	0.68	1.54
Warm-season forage species sampled Sept. 22	Pearl millet[3]	0.55	0.67
	German millet[4]		
	Sorghum sudangrass[3]		
	Sudangrass	0.49	0.46
	Teff[3]	0.49	0.5

[1]0 N = no nitrogen fertilizer; 50 N= 50 pounds per acre nitrogen fertilizer.

[2]Cool-season species were sampled based on forage maturity. Barley and cereal rye were sampled May 14 and triticale and the wheat varieties were sampled May 24.

[3]Stand and weed issues in plots due to crabgrass

[4]Single cut warm-season species

There were some stand issues with some of the warm-season species. While the sorghum sudan should have been harvested twice, it was just a single cut due to its poor stand and weed issues. In previous years of the study, crabgrass had been included as a species. Unfortunately, in plots that had previously been crabgrass, the crabgrass came back and caused weed issues particularly in the sorghum sudan plots but also in some of the teff plots and one of the Pearl millet plots. This likely had a negative impact on yield. The German millet is just a single cut warm-season species. The drier conditions likely also contributed to lower yields with the warm-season species compared to what we saw in previous years.

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