Evaluating Cover Crops and Summer Annual Forages for Beef Cattle (Year 2)

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Introduction

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 can potentially 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 two of this four-year study.

Materials and Methods

Cereal rye, barley, triticale, winter wheat, and forage winter wheat were seeded with a no-till drill September 18, 2019, into 1,050 sq ft forage plots. Eight replicates of each species were seeded with half of the plots (four) receiving no nitrogen (N) fertilization and half receiving 50 lb of N/acre. Samples were collected for nutritional analysis based on forage maturity in May 2020. 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/acre. Additionally, using a dryer and by taking serial weights until the weight was no longer decreasing, McNay 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, Japanese millet, sorghum sudangrass, crabgrass, and teff were planted June 24, 2020. Eight replicates of each species were seeded with half of the plots (four) receiving no N fertilization and half receiving 50 lb of N/acre July 6, 2020. Warm season annuals were sampled for nutritional analysis and yield August 12 and September 22, 2020 (Figure 1). Following harvest and termination of the 2020 warm-season forages, winter

cover crops were again planted to overwinter and will be sampled in the spring of 2021.

Results and Discussion

Nutrient quality of the summer annuals is found in Table 1. At the time of sampling, most species were in vegetative stages of growth to mimic grazing or harvest for silage. In general, the forages contained adequate protein and energy levels to support late-lactation or early-to-mid-gestation requirements of a beef cow.

Forage yield results are found in Table 2. Nitrogen application resulted in approximately 25 to 50 percent yield increase, which demonstrates 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 boot stage as the target end point. Barley and cereal rye were sampled May 7, triticale was sampled May 12, and wheat varieties were sampled May 20. The later sample dates for triticale and wheat species likely contributed to the greater yields for these species. The barley seemed to struggle with over-wintering and was notably less productive than the other cool-season species.

The crabgrass and teff did not grow well early in the season, and due to inadequate growth, were not sampled August 12, 2020. The Japanese millet did not regrow well, and due to inadequate growth, was not sampled September 9, 2020. Interestingly, the Japanese millet matured into reproductive stage and produced seed heads at approximately 3-4 in. of plant height.

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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	20.0	13.7	30.4	47.0	0.45	0.34	0.12	2.74	0.20	125	65.2	32.7
Cereal rye	17.5	12.6	31.6	48.3	0.22	0.36	0.11	3.01	0.16	119	64.3	31.5
Forage wheat	20.2	10.4	32.8	49.7	0.18	0.29	0.10	2.81	0.11	116	63.4	30.3
Triticale	21.2	10.0	25.7	41.0	0.22	0.26	0.09	2.50	0.12	152	68.9	34.2
Winter wheat	20.5	8.8	31.9	49.2	0.20	0.24	0.09	2.21	0.11	118	64.0	30.0
Warm-season forage species[2]												
Pearl millet	21.5	10.5	36.0	57.7	0.53	0.49	0.36	2.57	0.17	94	60.9	26.6
Japanese millet*	20.8	13.8	36.8	61.4	0.50	0.38	0.44	2.67	0.39	88	60.2	26.5
Sorghum sudangrass	21.3	11.2	33.3	56.7	0.49	0.33	0.34	1.92	0.12	101	65.1	28.1
Crabgrass*	24.9	11.3	37.5	58.7	0.33	0.32	0.47	2.18	0.17	93	59.7	27.3
Teff*	32.1	14.1	32.6	57.7	0.41	0.26	0.22	1.52	0.24	103	63.5	29.0

[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 August 12 and September 22, 2020.

*Due to inadequate growth, Crabgrass and Teff were not sampled August 12, 2020, and Japanese millet was not sampled September 22, 2020.

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

Cool-season forage species		
Sampled May 2020[2]	**0 N**	**50 N**
Barley	0.37	0.81
Cereal rye	0.65	1.22
Forage wheat	1.01	2.29
Triticale	0.77	1.79
Winter wheat	0.99	2.32
Warm-season forage species		
Sampled August 12, 2020	**0 N**	**50 N**
Pearl millet	1.05	2.15
Japanese millet	0.66	1.23
Sorghum sudangrass	1.43	3.12
Crabgrass	--	--
Teff	--	--
Sampled September 22, 2020	**0 N**	**50 N**
Pearl millet	0.29	0.21
Japanese millet	--	--
Sorghum sudangrass	0.23	0.14
Crabgrass	0.30	0.54
Teff	0.50	0.48

[1]0 N = no nitrogen fertilizer; 50 N= 50 lb/acre nitrogen fertilizer.
[2]Cool-season species were sampled based on forage maturity. Barley and cereal rye were sampled May 7, triticale was sampled May 12, and wheat varieties were sampled May 20.

Figure 1. Small forage harvester used to collect yield data on the warm-season annuals, August 2020.