Evaluating Cover Crops and Summer Annual Forages for Beef Cattle

RFR-A19106

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Introduction

A forage plot trial is being conducted to evaluate potential yield, nutritional value, forage crop nutrient removal, and economic sustainability of cover crops used in rotation with various summer annual forage species. Five species of summer annual forages were seeded July 1, 2019, with a no-till drill and sampled for nutritional analysis and yield prior to harvest and termination in late August. Plots then were seeded September 18, 2019, using a no-till drill with five species of winter cover crops, which will be analyzed for nutritional content and yield in the spring of 2020. This was the first of a four-year project, and implications will be determined on further data collection and analysis.

In addition to protecting Iowa's water quality and preserving valuable topsoil and nutrients, annual forages may provide an additional forage source to Iowa beef producers. Forages help minimize erosion, improve soil health, improve rainfall infiltration, and suppress weeds. Producers may be more inclined to use cover crops if they can realize a short-term benefit in addition to the long-term conservation benefits. One logical, potential short-term benefit is the use of cover crops as forage resources that may help producers stretch feed supplies, extend grazing seasons, increase carrying capacity, and allow for expansion. Greater knowledge of potential yield and nutritional value 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.

Materials and Methods

Pearl millet, Japanese millet, sorghum sudangrass, crabgrass, and teff were seeded 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 August 9. An image of some of the forages is shown in Figure 1. 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 and frozen until submission to a commercial laboratory for analysis. Yield data were collected August 15, 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. Summer annuals then were mowed and baled and on regrowth, were terminated with herbicide to prepare for planting of the winter cover crops. Barley, cereal rye, triticale, and two varieties of winter wheat were planted September 18, 2019. Again, eight replicates of each species were seeded with half of the plots (four) to receive no N fertilization and half to receive 50 lb of N/acre in the spring of 2020. Additionally, samples for analysis were to be collected in the spring of 2020.

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. Although slightly later than intended, the goal was to harvest the forages 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. Due to the weather implications, the annuals were seeded later than intended, so only were harvested at one time throughout the summer. The delayed planting also resulted in high weed presence in the crabgrass plots, so no yield data was collected for crabgrass. Nitrogen application resulted in an approximately 25–50 percent yield boost, demonstrating if producers are using annual forages as a forage source, fertilization is advantageous.

Acknowledgements

We gratefully acknowledge the Iowa Nutrient Research Center and the Southern Iowa Forage and Livestock Committee for financial support of the project. We also extend our gratitude to the farm staff at the Iowa State University McNay Research Farm, and to Millborn Seeds and Barenbrug for seed donation.

Table 1. Warm season forage species nutritional profiles.

	DM[1] (%)	CP (%)	ADF (%)	NDF (%)	Ca (%)	P (%)	Mg (%)	K (%)	S (%)	RVF	TDN (%)	NEg mcal/cwt
Teff	25.6	16.0	32.6	57.1	0.56	0.28	0.20	2.15	0.23	100.2	63.5	29.2
Pearl millet	20.4	9.3	35.2	63.6	0.60	0.33	0.26	2.94	0.15	88.4	61.5	24.5
Sorghum sudangrass	17.1	9.8	36.4	58.9	0.65	0.22	0.42	2.48	0.11	93.3	60.6	26.5
Japanese millet	18.3	10.9	36.2	58.6	0.78	0.31	0.53	3.24	0.30	93.9	60.7	27.0
Crabgrass*	17.8	23.6	26.6	37.7	0.77	0.32	0.83	3.72	0.25	142.9	68.1	37.6

[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.

*Due to slower growth and thus greater weed pressure, crabgrass was immature and much shorter in height compared with other forages. Therefore, crabgrass samples were taken very close to the ground surface.

Table 2. Warm season forage species yield (tons of DM/acre) without and with N fertilizer.

	0 lb Nitrogen	50 lb Nitrogen
Teff	1.04	1.72
Pearl millet	0.76	1.52
Sorghum sudangrass	1.85	2.92
Japanese millet	1.40	1.72
Crabgrass*	-	-

*Crabgrass yield was not significant enough to measure.

Figure 1. In the center of this picture is Japanese millet with N applied. To the immediate left, the taller forage is sorghum sudangrass, and to the immediate right is Japanese millet without N. Photo by Chris Clark.