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Summer Cocktail Forage Research in the Panhandle of Nebraska

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Summary with Implications

Four annual forage mixtures containing brown mid-rib sorghum sudangrass or German foxtail millet, cowpeas or soybeans, and forage collards were compared to the sorghum sudangrass or millet as monocultures in the Nebraska High Plains on dryland acres to determine the tonnage, crude protein, and digestibility available for beef cattle. The forage mixtures and the millet resulted in greater crude protein than the sorghum sudangrass. Total digestible nutrients of the mixers were similar. Sorghum sudangrass resulted in the most tonnage. These forage options could have been hayed or windrow grazed in the fall and would have likely resulted in 1.5–2.0 lb/d gain for 500 lb calves. Grazing these forages in the summer would have likely resulted in better quality but would require rotational grazing management. Agronomic impacts of these mixtures on the subsequent crop were not measured. Foxtail millet was the most economical crop to produce.

Introduction

The Nebraska Panhandle is in a unique environment in that it has low rainfall (12–14" annually) and also a high elevation (3800-just over 5000 ft.). The challenge this creates is that most permanent pastures are cool season predominate and therefore have a summer slump resulting in low quality and quantity. The additional challenge is in planting annual forages to supplement the permanent pastures. The high elevation delays soil warm up and the lack of moisture can make emergence a challenge.

Across the Midwest, forage cocktail mixtures have been gaining popularity in crop rotations. Typically at least three components are included in these mixtures: an annual grass for biomass production, a legume to add nitrogen to the soil, and a brassica or some deep rooted crop to alleviate soil compaction. While it is important to leave some residue of these crops to prevent erosion and capture moisture, if at least some utilization of the crop could be realized for cattle production, it would reduce grazing pressure on permanent pastures that often need relief from drought. Therefore, four summer annual mixtures were compared with two monocultures and evaluated for yield, crude protein (CP) and total digestible nutrients (TDN) calculated from acid detergent fiber (ADF) for beef cattle.

Procedure

Six treatments were evaluated as forage options for beef cattle in western Nebraska. The forages planted were 1) a monoculture of brown mid-rib (BMR) sorghum sudangrass (9 lb/ac), 2) a monoculture of German foxtail millet (8 lb/ac), 3) BMR sudangrass, soybeans, and a forage collard (10/20/2 lb/ac, respectively, 4) German foxtail millet, soybeans, a forage collard, 6/20/2 lb/ac, respectively, 5) BMR sudangrass, cowpeas, and a forage collard (10/18/2 lb/ac, respectively, or 6) German foxtail millet, cowpeas, and a forage collard (6/18/2 lb/ac, respectively). The plots were planted into proso millet stubble and hard red winter wheat was the subsequent crop planted that respective fall. Each treatment was replicated three times each year for two years. The forages were planted June 27and harvested September 9 in 2014 and were planted June 26 and harvested September 5, 2015 on dryland acres.

Results

Visual observation indicated the soybeans come up in 2014 but the cowpeas did very well. In 2015, both legumes emerged but production was somewhat limited in some plots. The tons of dry matter produced, crude protein (CP), TDN, and ADF of both years combined are shown in Table 1. The BMR sudangrass and the BMR sudangrass, soybeans, and forage collard produced the most tonnage with the German foxtail millet being statistically similar to the BMR sudangrass, soybeans, forage collard mix. Possibly, the reduced yield of the soybeans in the mixture made those treatments similar. The crude protein was lowest in the BMR sudangrass monoculture, most likely a function of the increased tonnage for that treatment. Total digestible nutrients were above 65% for all treatments making all the forage combinations a good quality forage resource for grazing cattle or to be used as a

Table 1. Tons/ac, CP, TDN, and ADF of summer annual monocultures and mixtures

	Tons/acre DM	CP, %DM	TDN, % DM	ADF, % DM
BMR Sudangrass	2.3[a]	7.3[a]	65.4[a]	33.2[a]
Foxtail Millet	1.8[bcd]	9.7	66.2[a]	32.7[a]
Sudan/soybeans/collards*	2.0[ac]	9.8	67.3[ab]	31.5[ab]
Millet/soybeans/collards*	1.5[d]	11.9	69.4[b]	29.6[b]
Sudan/cowpeas/collards	1.5[d]	10.4	69.1[b]	29.7[b]
Millet/cowpeas/collards	1.3	11.7	67.3[ab]	31.3[ab]

Means with unlike superscripts differ ($P < 0.05$).
*Soybeans did not contribute any dry matter in year 1.

Table 2. Seed, dry matter production, crude protein, and total digestible nutrients cost per acre of summer monocultures and mixtures

	Seed cost/acre, $	Cost/acre for DM tons produced, $	Cost/acre CP tons produced,$	Cost/acre tons of TDN produced, $
BMR Sudangrass	13.50	5.87	80.41	8.97
Foxtail Millet	4.50	2.50	25.77	3.78
Sudan/soybeans/ collards*	31.00	15.50	158.16	23.03
Millet/soybeans/ collards*	19.00	12.67	106.44	18.25
Sudan/cowpeas/collards	34.00	22.67	217.95	32.80
Millet/cowpeas/collards	22.50	16.92	144.64	25.15

hay crop. Acid detergent fiber was lowest for treatments containing mixtures.

The cost of the seed and the subsequent cost of the tons of forage DM, CP, and TDN were calculated (Table 2). Fertilizer, planting, and harvesting costs were not included in the calculations as they were assumed to be the same for each treatment. The monoculture of German Foxtail Millet produced the least expensive tons of DM, CP, and TDN. Adding the legumes and brassica to the annual grass substantially increased the cost of producing the forage. This study did not look at agronomic impacts of planting cocktails, only the quality of the forage mixtures for beef cattle. The agronomic benefits on the subsequent crop would need to be substantial to offset the production costs of the mixtures. As previously mentioned, the crops were planted the last week of June. Possibly, more summer growth would have occurred if the crops had been planted the second week of June. Previous research at the High Plains Ag Lab near Sidney, NE has indicated that the window of opportunity for planting summer annuals in the Panhandle is fairly narrow. In 2014 the rainfall totals for the area were 3.42, 0.35, and 2.91 inches for June, July, and August, respectively. As a result of the limited rainfall in July, the forage did not experience a lot of growth in July and would have been difficult to graze at that time. Rainfall returned to the area in early August and the forages grew rapidly. For producers trying to manage summer annuals for grazing, this would have been challenging. In 2015 the rainfall totals were 2.10, 1.64, and 0.54 inches for June, July, and August, respectively, resulting in more consistent growth.

These results suggest if a producer wanted the forages in this experiment for fall windrow grazing or winter hay, they did produce acceptable tonnage and quality by early September. However, the expense of the seed must be carefully evaluated relative to the producers' production and agronomic goals. This research was funded by the Nebraska Cattlemen's Foundation and the seed was supplied by Green Cover Seed in Bladen, NE.

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