Interseeding Sorghum-Sudangrass into Perennial Cool-Season Western Wheatgrass Pasture

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Introduction

Conversion of pastureland into cropland has occurred at a rapid rate on the Great Plains. A reduction in total acreage of pastureland from this conversion has resulted in a decline of total numbers of beef cows in the same region. One method to mitigate the decline in cow numbers is to increase the carrying capacity of the remaining pastureland acres. To achieve this goal, a study was conducted to introduce warm-season annual grass species into perennial cool-season grass pastures to increase dry matter production during the mid-summer time period that perennial cool-season grasses would be most dormant. An increase in production during this time period could result in a significant overall increase in total land area production.

Experimental Procedures

Three warm-season annual grasses (sorghum-sudangrass, crabgrass, and teff) were no-till drilled at three seeding rates (0.5X, 1.0X, and 1.5X) into perennial cool-season western wheatgrass pasture within a randomized complete block design experiment with three replications. Western wheatgrass was harvested at a 4-inch height with a self-propelled harvester with load cells in June of each year to determine forage yield. Subsamples were collected by hand from the harvester, were dried in a forced air oven for 72 hours, and weighed. Following wheatgrass harvest, warm-season annual grasses were seeded with a no-till drill in 12-inch spaced rows, and the plots were then fertilized with 60 lb N/acre. The base rates for 1.0X seeding rates were 40, 11, and 6.5 lb/acre for sorghum-sudangrass, teff, and crabgrass, respectively. Population density of the warm-season annual grasses was measured within a 2-ft^2 frame from three locations (total of 6 feet of row) in each plot following emergence, and warm-season annual grasses were harvested for yield determination at a 4-inch height at 90 days after planting. Warm-season annual grass samples were dried in a forced air oven for 72 hours, and weighed. The following spring, western wheatgrass was fertilized early with 60 lb N/acre and was harvested with a self-propelled harvester in late spring to see if warm-season annual grass growth during the prior year had an effect on subsequent perennial cool-season grass growth.

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Results and Discussion

Western wheatgrass yields prior to seeding warm-season annual grasses ranged from 1740–3070 lb/acre in 2020 and 1250–1790 lb/acre in 2021 and were not different among treatments. The lack of rainfall in June 2021 reduced forage yield potential of western wheatgrass compared to 2020. Following wheatgrass harvest in June, soil was dry in both years, and precipitation was not adequate for germination of annual warm-season grasses. Sorghum-sudangrass was the only warm-season annual grass that established and maintained acceptable stands in either year (Table 1). At 90 days after seeding, sorghum-sudangrass plots averaged 6600 lb/acre additional forage in 2020, but just over 800 lb/acre additional forage was produced in 2021 (Table 2). Sorghum-sudangrass seeded at the 1.5X rate produced more forage in 2021 than the 0.5X rate. Productive crabgrass and teff plants were rare and resulted in no additional harvestable forage in either year. In spring of 2021, plots with sorghum-sudangrass in 2020 had western wheatgrass yields that averaged 440–730 lb/acre less than the control plot and the averages of the failed teff and crabgrass seedings (Table 3). This resulted in a net forage increase of 5870–6160 lb/acre over the two years of production.

Implications

Establishing sorghum-sudangrass in cool-season western wheatgrass pasture improved total forage production over two years with a net increase of nearly 3 tons of forage/acre compared to the cool-season grass alone. Vast improvements in production on limited pastureland resources are possible during years of greater precipitation. Greater forage production in turn increases the total number of beef cows the land area could support through grazing or haying.

Table 1. Annual warm-season grass plant populations three weeks after seeding into western wheatgrass pasture in 2020 and 2021

Warm-season grass species and seeding rate	2020	2021
	plants/acre	
Crabgrass 0.5X	21780	7260
Crabgrass 1.0X	36300	19360
Crabgrass 1.5X	75020	65340
Sorghum-sudan 0.5X	65340	41140
Sorghum-sudan 1.0X	111320	55660
Sorghum-sudan 1.5X	162140	77440
Teff 0.5X	12100	12100
Teff 1.0X	24200	12100
Teff 1.5X	38720	21780

Table 2. Annual warm-season grass yield in 2020 and 2021 after seeding into harvested western wheatgrass pasture. Teff and crabgrass did not establish well and did not result in harvestable forage.

Warm-season grass species and seeding rate	2020	2021
	lb/acre*	
Sorghum-sudan 0.5X	7180	670 b
Sorghum-sudan 1.0X	5950	750 ab
Sorghum-sudan 1.5X	6670	1020 a
Average	6600	810

* Values in a column with different letters are significantly different at $P \leq 0.05$.

Table 3. Western wheatgrass pasture yield in 2021 following seeding of annual warm-season grasses in 2020

Warm-season grass species and seeding rate	2021	Species average
	lb/acre*	
Crabgrass 0.5X	3070 abc	
Crabgrass 1.0X	2740 bcd	
Crabgrass 1.5X	3130 abc	2977
Sorghum-sudan 0.5X	2840 abcd	
Sorghum-sudan 1.0X	2520 cd	
Sorghum-sudan 1.5X	2250 d	2538
Teff 0.5X	3190 ab	
Teff 1.0X	3140 abc	
Teff 1.5X	3460 a	3267
Unseeded control	3170 abc	

* Values in a column with different letters are significantly different at $P \leq 0.05$.