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Interseeding Warm-Season Annual Grasses into Perennial Cool-Season Western Wheatgrass Pasture

Keith Harmoney and John Guretzky¹

Introduction

Conversion of pastureland into cropland has occurred at a rapid rate on the central to northern 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 carrying capacity of the remaining pastureland acres. Introducing 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 is one strategy that may be able to boost production. An increase in production during this time period could result in an overall increase in total land area biomass production to be able to maintain or increase the number of cow units per acre of pastureland.

Experimental Procedures

Five warm-season annual grasses [forage sorghum (*Sorghum bicolor*), sudangrass (*Sorghum bicolor* ssp. *drummondii*), sorghum-sudangrass hybrid, pearl millet (*Pennisetum glaucum*), and corn (*Zea mays*)] were no-till-drilled into perennial cool-season western wheatgrass pasture within a randomized complete block design experiment with four replications. Western wheatgrass was harvested at a 4-inch height in late spring prior to annual warm-season grass seeding in 2015. Following wheatgrass harvest, warm-season annual grasses were no-till drilled in 12-inch row spacings at a seeding depth of one inch. At the time of emergence, plots were then broadcast fertilized with 60 lb of N/acre. Also, shortly after emergence, population density was measured in the center two rows of each subplot. Warm-season grasses were harvested at a 6-inch height for yield determination at 45 and 90 days after planting with a self-propelled flail harvester. Warm-season annual grasses harvested at 45 days were allowed to accumulate regrowth and were also harvested at 90 days to represent a 2-cut system, while annual grasses harvested one time at 90 days represented a 1-cut system. Western wheatgrass growing in plots the following year was harvested again in late spring to determine production effects of prior year warm-season grass interseeding. The experiment was repeated at a different field location in 2016.

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Results and Discussion

Western wheatgrass yields prior to seeding warm-season annual grasses and the year after seeding warm-season annual grasses were not different among the annuals for either the 2015 or 2016 seeding. Therefore, seeding warm-season annuals had no effect on western wheatgrass yield the next year. The lack of rainfall in 2015 during the end of May and all of June reduced dry matter yield production potential of western wheatgrass. Following wheatgrass harvest in June, soil was dry, and lacked precipitation for germination of annual warm-season grasses until mid-July. In 2015, emergence and establishment of annual warm-season grasses was poor. Pearl millet was the only annual warm-season grass that established a population of more than 10,000 plants/acre. Annual warm-season grasses desiccated under continued dry conditions before harvest and resulted in 0 population at time of harvest. The 2016 seeded annual warm-season grasses, with more abundant precipitation resulting in excellent stands, had much greater emergence and survival than in 2015. Annual warm-season grass yields were greatest for sudangrass and sorghum-sudangrass in 2016, and yield from a 1-cut harvest system was typically greater than the total yield of the 2-cut harvest system. The lack of any effect on western wheatgrass yield following the 2015 warm-season annual grass seeding could be attributed to the lack of moisture and lack of any growth of the warm-season grasses during the summer of 2015 to affect western wheatgrass the next spring. However, in 2016, ample moisture was present for annual warm-season grasses to establish and to accumulate abundant yield. Even though more than 1-2 ton/acre of forage was produced by some warm-season annual grasses during 2016, this forage growth had no effect on subsequent western wheatgrass yield the next spring.

Implications

Summer precipitation had the greatest effect on the success or failure of warm-season annual grasses to provide extra forage when interseeded into cool-season grass pasture. With average summer precipitation, interseeding warm-season annual grasses from the sorghum family into semi-dormant western wheatgrass pasture provided abundant extra forage. During years of low summer precipitation, this management practice involves much greater risk.

Table 1. Western wheatgrass dry matter yield prior to planting warm-season annual grasses into wheatgrass stubble, and dry matter yield the year after seeding

Warm-season grass species	Western wheatgrass DM yield			
	Seeding year 2015	2nd year 2016	Seeding year 2016	2nd year 2017
	----- lb/acre -----			
Sorghum-sudangrass	1351	5642	2357	3288
Sudangrass	1447	4755	2502	3614
Pearl millet	1384	5374	2918	3693
Corn	1257	4754	2548	3870
Forage sorghum	1604	4658	2733	3313
Non-seeded control	1463	4925	2740	3250

Within a column, no statistical differences were detected within any year.

Table 2. Annual warm-season grass early plant populations and total annual warm-season grass yields when seeded into western wheatgrass pasture

Warm-season grass species	2015	2016	One harvest 2016	Two harvests 2016
	----- plants/acre -----		----- lb/acre -----	
Sorghum-sudangrass	2668 bc	292911 b	4457 ay	2349 az
Sudangrass	5554 b	243955 b	3446 by	1688 abz
Pearl millet	11271 a	613206 a	1138 c	1158 bc
Corn	54 c	50616 c	709 c	848 bc
Forage sorghum	926 c	281295 b	2614 by	1239 bcz
Non-seeded control	0 c	0 c	282 c	570 c

a,b,c = within a year, different letters are significant between grasses at $P \leq 0.05$.

y,z = within a grass, different letters are significant between harvests at $P \leq 0.05$.