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Summary

Tall fescue production was studied during a fourth year of continuous research at two locations. In 2016, the fescue at Site 1 was affected by nitrogen (N) and phosphorus (P) fertilization in the spring, but the response was less defined in the fall harvest. At Site 2 in 2017, fescue production was mainly affected by N rate, with marginal response to potassium (K) fertilization.

Introduction

Tall fescue is the major cool-season grass in southeastern Kansas. Perennial grass crops, as with annual row crops, rely on proper fertilization for optimum production; however, meadows and pastures are often under-fertilized and produce low quantities of low-quality forage. Even when new stands are established, this is often true. The objective of this study was to determine whether N, P, and K fertilization improves yields during the early years of a stand.

Experimental Procedures

The experiment was established on two adjacent sites in the fall of 2012 (Site 1) and 2013 (Site 2) at the Parsons Unit of the Kansas State University Southeast Agricultural Research Center. The soil at both sites was a Parsons silt loam soil with initial soil test values of 5.9 pH, 2.8% organic matter, 4.2 ppm P, 70 ppm K, 3.9 ppm NH_4-N, and 37.9 ppm NO_3-N in the top 6 inches at Site 1; and 6.5 pH, 2.2% organic matter, 6.7 ppm P, 58 ppm K, 6.8 ppm NH_4-N, and 12.3 ppm NO_3-N in the top 6 inches at Site 2. The experimental design was a split-plot arrangement of a randomized complete block. The six whole plots received combinations of P_2O_5 and K_2O fertilizer levels allowing for two separate analyses: 1) four levels of P_2O_5 consisting of 0, 25, and 50 lb/a each year and a fourth treatment of 100 lb/a only applied at the beginning of the study; and 2) a 2 × 2 factorial combination of two levels of P_2O_5 (0 and 50 lb/a) and two levels of K_2O (0 and 40 lb/a). Subplots were four levels of N fertilization consisting of 0, 50, 100, and 150 lb/a. Phosphorus and K fertilizers were broadcast applied in the fall as 0-46-0 (triple superphosphate) and 0-0-60 (potassium chloride). Nitrogen was broadcast applied in late winter as 46-0-0 (urea) solid. Fourth-year sampling and harvest dates from each site were as follows. Early growth yield as an estimate of grazing potential in

early spring was taken at E2 (jointing) growth stage on April 22, 2016, at Site 1 and on April 19, 2017, at Site 2 from a subarea of each plot not used for later spring and fall harvests. Spring yield was measured at R4 (half bloom) on May 13, 2016, at Site 1 and on May 15, 2017, at Site 2. Fall harvest was taken on September 21, 2016, at Site 1 and on September 13, 2017, at Site 2.

Results and Discussion

Fourth-year production of tall fescue was measured at Site 1 in 2016 and at Site 2 in 2017. At site 1 in 2016, early yield at the E2 (jointing) growth stage, measured to estimate forage available if grazed early, was increased with 50 lb P_2O_5/a (Table 1), and was increased with N rates of 100 or 150 lb/a above yield with no N added. At the R4 stage of hay harvest in 2016, yield was increased by P fertilization, but with no difference between rates. Nitrogen fertilizer additions up to 150 lb/a increased R4 hay yield. Fall yields were unaffected by P fertilization. Apparent mineralization during the summer resulted greater fall yield with no N as compared to the 50 and 100 lb N/a rates applied in late winter. Total yield was maximized with P fertilization and N applied at 150 lb/a.

For the fourth year of production at Site 2 (2017), yield was mainly affected by N rate. Sampling at E2 and R4 and fall harvest yields were not affected by P fertilization (Table 2) and response to K fertilization was marginal (data not shown). Increasing N rates tended to increase yield at the E2 sampling, R4 hay harvest, and total (R4 + fall) yield, especially with K fertilization (data not shown), but response was less defined at the fall harvest (Table 2). Total yield averaged less than 3.5 ton/a, even at the 150 lb/a N rate.

Table 1. Fourth-year yield of newly established tall fescue in the spring and fall 2016 as affected by the interaction of P_2O_5 and nitrogen (N) fertilization rates at Site 1

	Yield			
	Spring			Total
P_2O_5	E2 (jointing)	R4 (half-bloom)	Fall harvest	(R4 + Fall)
lb/a	---------- ton/a, 12% moisture ----------			
0	0.19	0.93	1.25	2.18
25	0.21	1.14	1.34	2.48
50	0.28	1.19	1.38	2.57
100[1]	0.29	1.19	1.37	2.56
LSD (0.10)	0.07	0.16	NS	0.26
N				
lb/a				
0	0.10	0.18	1.40	1.58
50	0.12	0.89	1.12	2.01
100	0.34	1.53	1.23	2.76
150	0.42	1.84	1.60	3.44
LSD (0.05)	0.07	0.09	0.16	0.18

[1]The 100 lb P_2O_5/a rate was only applied at the beginning of the study (Fall 2012).

Table 2. Fourth-year yield of newly established tall fescue in the spring and fall 2017 as affected by P_2O_5 and nitrogen (N) fertilization rates at Site 2

	Yield			
	Spring			Total
P_2O_5	E2 (jointing)	R4 (half-bloom)	Fall harvest	(R4 + Fall)
lb/a	---------- ton/a, 12% moisture ----------			
0	0.28	0.67	0.76	1.43
25	0.26	0.62	0.73	1.34
50	0.30	0.74	0.78	1.52
100[1]	0.31	0.66	0.73	1.39
LSD (0.05)	NS	NS	NS	NS
N				
lb/a				
0	0.05	0.11	0.69	0.80
50	0.21	0.42	0.56	0.98
100	0.42	0.89	0.78	1.68
150	0.48	1.26	0.96	2.22
LSD (0.05)	0.08	0.13	0.08	0.18

[1]The 100 lb P_2O_5/a rate was only applied at the beginning of the study (Fall 2013).