Forage Research in Texas

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STAND RECOVERY OF COASTAL BERMUDAGRASS FOLLOWING POTASSIUM DEFICIENCY-INDUCED STAND LOSS

OBJECTIVES:

Evaluate Coastal bermudagrass stand recovery after potassium-induced stand loss and to characterize identifiable characteristics of a Coastal bermudagrass sward.

PROCEDURE:

Plots used for a P and K rate study on Coastal bermudagrass were used. Differing Coastal bermudagrass stands had been developed by the K fertility level. Darco (Grossarenic Paleudult; loamy, siliceous, thermic) and Cuthbert (Typic Hapudult; clayey, mixed, thermic) soils were used. Treatments consisted of a 3 x 3 complete factorial of P and K rates (Table 1) arranged in a randomized complete block with four replicates. All forage was clipped and removed from plots to simulate hay harvesting procedures. During 1977 the plot area was shredded with a rotary mower and let lay when the sward height was 25 to 40 cm. Plot dimensions were 2.7 x 27m and 2.4 x 2.7m on Darco and Cuthbert soil, respectively.

Beginning in 1978 all forage was again removed at harvest. Treatments of the experiments were changed as shown in Table 1. All fertilizer treatments on the Darco soil received the high K rate except for the plots that had previously received 112 kg/ha P and K. Plots on Cuthbert soil were split and one half sprayed with (simazine) 2-chloro-4,6-bis(ethylamino)-s-triazine and (diuron) 3-(3,4-dichlorophenyl)-1,1-dimethylurea each at 1.12 kg/ha AI prior to growth in the spring for preemergence weed control.

Data were taken for yield, stem length, stem weight, stand and rhizome production. Stand, stem length, and stem weight was measured by taking a grab sample from the harvested area. Individual stem length of 10 stems were measured, counted, and weighed. Rhizomes were measured using a 15cm square by 15 cm deep plug. Rhizomes were separated from soil, roots, and aerial plant parts. Dead rhizomes (those easily crushed by applying a slight pressure with the fingers) were also separated. All plant material was dried at 72°C for 48 hours before weighing.

An auxiliary experiment was conducted on fertilizer demonstration experiments throughout East Texas. It consisted of trying to characterize a thin stand under production circumstances. A 15 cm square jig was used to harvest a small area at random in a production field and to note any visual characteristics of bermudagrass stands that could be used in an educational program for grower recognition of stand loss before major losses occurred.

RESULTS AND DISCUSSION: Bermudagrass yield differences for both the Darco and Cuthbert soil are shown in Tables 2 and 3. The residual nature of the prior K treatments is immediately apparent on both soils. The 1978 and 79 growing seasons were dry after the first cutting on both sites. The yield loss persisted through the entire 1978 growing season on Cuthbert soil. However, a marked recovery had occurred by July 17 on the Cuthbert soil. The influence of stand deterioration on loss of yield was masked by dry weather after the first cutting on the Darco soil in 1978. This is shown by the comparison of all treatments with that receiving no K. In 1979, the Darco soil shows a tendency for yield losses owing to prior K deficiency on the first cutting but this was not statistically significant. The stand on Darco soil had definitely recovered yield by the second cutting in 1979.

An analysis of the yield components of stand density, stem length, and stem weight is shown in Tables 4 and 5. No difference was found in the weight of individual stems regardless of previous K rates. The differences found in stem length was when there was an 83% and 36% yield loss on Cuthbert soil. Conversely, a 40% yield reduction resulted in no differences in stem length on a Cuthbert soil. In general, the differences in stand density paralleled yield differences on both soils.

Under drought conditions late in the season the sward compensated with reduced stand and shorter lighter plants at both locations. The fact that more yield was produced under adequate K fertilization early in the season but yields were the same late in the season under drought conditions indicates that adequate K fertilization results in the most efficient utilization of available water. Under adequate K fertilization, no difference was found in rhizome production with the average being 3990 and 3240 kg/ha on Darco and Cuthbert soil, respectively. Weed control had no effect on yield nor on weeds in the stand at the end of the two years of the study.

Trying to characterize a stand in growers' fields by counting the number of stems in a small area was confounded with infestations of common bermudagrass and with wide fluctuations in the stand from droughts. The type fluctuation obtained from droughts is shown in the data reported in Tables 4 and 5. Visually, early in the season a thin stand was found to be recognized by growers by the appearance of bare ground as they looked at the sward one to three meters from them. Doing the same type of observations in plots revealed that as much as one half of the yield was

lost before stand thinning could be recognized. The point of visual recognition was at about 1500 plants per square m. The best educational tool for recognition of the problem on growers fields appeared to be a well fertilized strip through his meadow.

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Table 1. Fertility treatments of the two areas used in the stand recovery experiments.

	Experimental Duration	Annual Fertility Rates		
		N	P	K
		kg/ha		
Darco	1969-1976	504	0,68,136	0,112,224
	1977	0	0	0
	1978-1979	336	112	0,224
Cuthbert	1974-1976	364-392	0,59,118	0,112,224
	1977	176	0	0
	1978-1979	224	112	224

Table 2. Coastal bermudagrass yield on Darco soil following stand decay from K deficiency.

Fertility Treatments Prior to 1978		Fertility Treatments Beginning in 1978		Yield					
				5-29-78	8-1-78	10-11-78	6-7-79	7-19-79	8-20-79
P	K	P	K	kg/ha					
0	0	136	224	4288 b-d*	2167 a	1618 a	3134 ab	2955 a	4458 a
0	112	136	224	4557 a-c	1905 a	1653 a	4374 a	2251 ab	4796 a
0	224	136	224	5054 a	2078 a	1496 a	3524 ab	2776 a	4663 a
68	0	136	224	3583 d-e	2084 a	1513 a	2718 ab	2396 ab	4276 a
68	112	136	224	4656 a-c	2259 a	1647 a	4106 a	2520 ab	4717 a
68	224	136	224	4988 a-b	1935 a	1581 a	3957 a	2596 a	4739 a
136	0	136	0	3044 e	1861 a	1195 a	1874 b	1806 b	2038 b
136	112	136	224	4209 c-d	1737 a	1369 a	3698 a	2220 ab	4038 a
136	224	136	224	4988 a-b	2039 a	1593 a	4343 a	2482 ab	4713 a

*Numbers followed by the same letter in the same column were not found to differ statistically at the 5% level according to Duncan's New Multiple Range Test.

Table 3. Coastal bermudagrass yield and stand characteristics on Cuthbert soil following stand decay from K deficiency. Plots fertilized uniformly with 112 and 224 kg/ha of P and K, respectively.

K rates Prior to 1978	Yield			
	5-23-78	7-17-78	6-18-79	8-1-79
	kg/ha			
0	645 c*	1893 b	5662 a	4518 a
112	2439 b	2471 a	6080 a	4718 a
224	3837 a	2625 a	6301 a	4830 a

*Numbers in same column followed by same letter are not significantly different at the 5% level according to Duncan's New Multiple Range Test.

Table 4. Coastal bermudagrass stand characteristics on Darco soil following stand decay from K deficiency.

Fertility Treatments Prior to 1978		Fertility Treatments Beginning in 1978		Stem Length			Stem Weight		
				Harvest Date					
				5-29-78	8-1-78	10-11-78	5-29-78	8-1-78	10-11-78
P	K	P	K						
kg/ha				CM			g/stem		
0	0	136	224	35.3 a*	20.9 a	18.2 a	0.19 a	0.21 a	0.15 a
0	112	136	224	32.4 a	18.2 a	20.8 a	0.17 a	0.19 a	0.20 a
0	224	136	224	30.9 a	18.3 a	22.8 a	0.17 a	0.17 a	0.18 a
68	0	136	224	28.6 a	21.3 a	20.2 a	0.19 a	0.19 a	0.17 a
68	112	136	224	29.1 a	21.1 a	22.3 a	0.17 a	0.19 a	0.18 a
68	224	136	224	31.1 a	17.8 a	22.7 a	0.17 a	0.19 a	0.17 a
136	0	136	0	31.6 a	20.9 a	16.2 a	0.15 a	0.19 a	0.17 a
136	112	136	224	32.2 a	19.0 a	20.9 a	0.19 a	0.19 a	0.24 a
136	224	136	224	32.3 a	18.0 a	19.3 a	0.19 a	0.19 a	0.20 a

*Numbers in the same column followed by the same letter were not found to differ statistically at the 5% level according to Duncan's New Multiple Range Test.

Table 4 (cont'd). Coastal bermudagrass stand characteristics on Darco soil following stand decay from K deficiency.

Fertility Treatments Prior to 1978		Fertility Treatments Beginning in 1978		Stand		
				Harvest Date		
				5-29-78	8-1-78	10-11-78
P	K	P	K	# Plants/m^2		
kg/ha						
0	0	136	224	2262 bc	1044 a	1067 a
0	112	136	224	2644 ab	1054 a	817 a
0	224	136	224	2908 a	1202 a	883 a
68	0	136	224	1934 c	1086 a	885 a
68	112	136	224	2683 ab	1167 a	976 a
68	224	136	224	2896 a	1045 a	950 a
136	0	136	0	2041 c	1004 a	712 a
136	112	136	224	2259 bc	931 a	620 a
136	224	136	224	2684 ab	1078 a	775 a

*Numbers in the same column followed by the same letter were not found to differ statistically at the 5% level according to Duncan's New Multiple Range Test.

Table 5. Coastal bermudagrass stand characteristics on Cuthbert soil following stand decay from potassium deficiency.

	K RATES PRIOR TO 1978							
	5-23-78				7-17-78			
	0	112	224	LSD	0	112	224	LSD
	kg/ha							
Stem length (cm)	20.5	24.4	30.3	1.9	20.4	23.9	20.5	4.2
Stand (# plants/m^2)	661	1574	2537	283	1393	1564	1937	384
Stem weight (g/stem)	0.12	0.15	0.15	0.15	0.04	0.16	0.14	0.02