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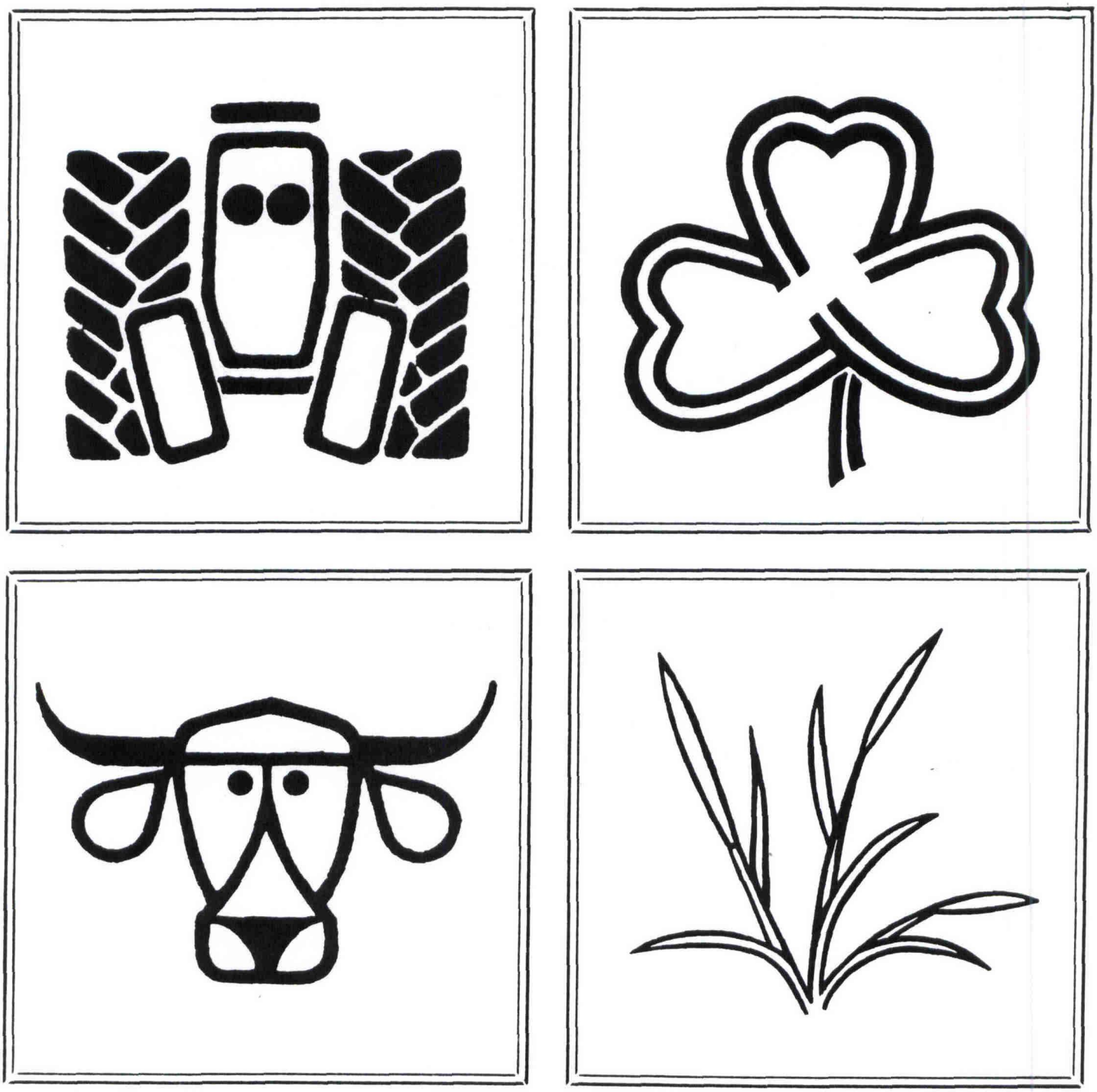

Forage Research in Texas

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The Performance of Cool-season Forage Mixtures with Coastal Bermudagrass

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SUMMARY

Warm-season grass pastures, especially bermudagrass, are frequently overseeded with cool-season annual crops for winter pasture. In a study in the Brazos River bottom on Miller clay soil, Gulf ryegrass, Yuchi arrowleaf clover or a mixture of the two overseeded on Coastal bermudagrass increased production through April about 1,500 pounds per acre. Mid-summer Coastal production appeared to be less where winter crops had been grown resulting in about the same total production per year with or without overseeding. While the cool-season crops (ryegrass and Yuchi clover) responded to both fall and spring applied nitrogen, the yield response was only in the range of 8 to 11 pounds of production per pound of nitrogen applied. The level of production in the presence of no fall or spring nitrogen and 70 pound per acre of nitrogen in June suggests that considerable soil nitrogen is available on the test site and that responses might be different when soil nitrogen is depleted or on a less fertile site.

INTRODUCTION

Sod-seeding cool-season annual crops on perennial grass stands may extend the pasture production season several weeks or even months. The cool-season grasses and legumes generally have better forage quality than perennial warm-season grasses, thus forage quality may be improved. If a legume is used in overseeding operations, it may fix appreciable amounts of nitrogen, thereby reducing the amount of applied nitrogen necessary for summer production of the permanent sod. Sod-seeding requires no seedbed preparation and therefore the energy expenditure for sod-seeding is less than that required for seeding on prepared seedbed. But forage production from sod-seeding is generally less than that resulting from prepared seedbed plantings. Also, spring growth of the annual crop may

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emove soil moisture that would otherwise be available to the permanent sod thus reducing summer production. This may be increasingly important where total rainfall is below 40 inches annually. Quantification of summer growth responses and energy inputs is needed as a more complete basis for evaluating sod seeding.

MATERIALS AND METHODS

Gulf ryegrass and Yuchi arrowleaf clover were overseeded separately and in a mixture together on Coastal bermudagrass in late September 1982. Individual plots were 6 x 20 feet, three replications in a split-split plot design. Three mixtures constituted the main plots: (1) Gulf ryegrass, (2) Yuchi clover, (3) Gulf + Yuchi. Superimposed on each main plot were nine nitrogen treatments consisting of 3 fall rates and 3 spring rates in all combinations, as follows: 0, 50 and 100 pounds N per acre at planting, and 0, 50 and 100 in March, except that Yuchi alone received 0, 25 and 50 at planting . In addition a blanket application of 70 pounds of N was applied in June.

Gulf ryegrass was seeded at 30 pounds per acre and Yuchi clover at 20 pounds per acre on plots that had been seeded at these same rates in 1981. Rescue and some ryegrass volunteered throughout the plot area resulting in wintergrass mixture in the Yuchi plots. Replicated check plots with three spring (March) nitrogen rates (0, 50, 100 pounds per acre) were provided by desiccating all winter crop growth in early spring.

RESULTS

Good stands were obtained from fall overseedings on Coastal bermudagrass. However, minimal growth was made during the winter even though temperatures were very mild. March 3 yields averaged only about 700 pounds per acre.

The average yields of the three overseeding treatments and Coastal alone by harvest dates are shown in Table 1. The data represent averages of three fall nitrogen rates in all combinations with three spring nitrogen rates. Ryegrass overseeded on Coastal and Coastal alone produced more forage than ryegrass plus Yuchi overseeded on Coastal.

Nitrogen effects on yields of the individual mixtures are shown in Table 2. The lowest average yield across all mixtures was with no nitrogen and the highest average yield was with 100 pounds each fall and spring. There was a linear response in average yield to fall nitrogen rate if no spring nitrogen was applied. However in the presence of either 50 or 100 pounds of spring nitrogen, the average response to fall nitrogen was quadratic with no difference between 0 and 50 pounds. This would

suggest that the response to fall nitrogen occurred primarily after early March when the spring nitrogen was applied. On the otherhand the response in average yield to spring applied nitrogen was linear regardless of the rate of fall nitrogen. These responses suggest that at least 100 pounds of nitrogen be applied in the fall in order to be effective, followed by 50 or 100 pounds in the spring dependent on growth conditions and forage needs.

If only the growing season involving the overseeded crops is considered (data not shown), 50 pounds of N in the fall and 50 pounds in March maximized production in ryegrass overseeded plots or 100 pounds in the fall maximized ryegrass + Yuchi and Yuchi plots. Averaged across all mixtures, either 50 or 100 pounds N in the fall followed by 50 or 100 pounds in the spring resulted in about 2 tons of production by late May with a maximum of 300 pounds of difference among the nitrogen treatements.

The linear response to spring applied nitrogen can be seen in the average yields in Table 3. The quadratic response to fall applied nitrogen is evident in average yield and in the presence of 50 or 100 pounds of spring N. Spring applied N resulted in 11 pounds of forage for each pound of N applied while fall applied N provided 8 pounds of forage for each pound of N applied at the 100 pound rate. These are minimal reponses probably because of climatic factors limiting plant growth, biological nitrogen fixation, and a high level of soil N.

Plant separations were made at each harvest to determine the contribution of components of the mixture. The data were variable and showed no major patterns related to nitrogen application except that the population of Yuchi clover in May and June tended to decrease with increased amounts of spring applied nitrogen.

The botanical data are summarized by overseeding mixtures in Table 4. The large amounts of Coastal bermudagrass in March do not represent new growth but are dead material that accumulated after the study was seeded in the fall. There was some volunteer rescue and ryegrass as evidenced by the presence of up to 37% wintergrass in Yuchi overseeded plots. Wintergrass consituted a high percentage of the forage through April where ryegrass alone was overseeded. However, ryegrass disappeared earlier than clover resulting in a higher percentage of Coastal in the mixture after April where ryegrass alone was overseeded. Yuchi constituted over 15% of the mixture through June.

Total yield of the sod-seeded mixtures followed the same pattern in each of the two years (Table 5). However, Coastal alone produced as much as any mixture with Coastal in 1983 but not in 1982. The mixture yields were about 2.5 tons less in 1983

than 1982. This may be due to less favorable environmental conditions but more likely represents a less favorable nutrient level. Production in 1982 was very high relative to the fertility treatments. The plots were located in a pasture that had been fertilized for several years with 200 pounds of nitrogen per acre. Some nitrogen buildup may have ocurred in this alluvial clay soil. The reduced yields in 1983 may represent some depletion of nutrients in the plot area. The objective of the study is to determine production with minimal cost inputs and not to maximize production. It would likely be possible to increase summer production with additional fertilizer applications.

Table 1. Average forage yield of various winter overseeding mixtures with Coastal bermudagrass, 1983

Mixture with Coastal	Date of harvest						
	Mar. 3	Apr. 21	May 26	June 28	Aug. 12	Sep 15	Total
	pounds of dry forage per acre						
Ryegrass	803a	1427b	1262b	1216a	3194b	2212a	10114a
Yuchi clover	772a	1728ab	1675a	836b	2478c	2186a	9675ab
Ryegrass + Yuchi	626a	1852a	1188b	885b	2172d	2046a	8769b
Coastal alone	638a	380c	1439ab	1186a	4816a	2171a	10630a

Values within a column followed by the same letter are not significantly different at the 0.05 probability level.

Table 2. The influence of rate and time of application of nitrogen and total forage yield of Coastal- overseeding mixtures 1983

Nitrogen lb/acre Fall	spring	Ryegrass	Yuchi + Yuchi	Ryegrass alone	Coastal	Average
		pounds of dry forage per acre				
0	0	-	9270	7569	7967	8269 c
	50	-	9999	8239	9662	9300 abc
	100	-	8117	9216	11040	9828 ab
Average		-	9499	8341	9556	9132
50	0	9440	8018	8840	-	8766 cb
	50	10109	8576	8940	-	9208 abc
	100	9258	10549	8823		9143 abc
Average		9602	9048	8868	-	9173
100	0	9388	10105	8872	-	9455 abc
	50	10529	9064	9858	-	9817 ab
	100	11077	10811	9575	-	10488 a
Average		10331	9993	9435	-	9920

Average yields followed by the same letter are not significantly different at the 0.05 probability level.

Table 3. Average response to fall and spring fertilizer applications, 1983

Fall N, lb/ac	Spring N, lb/ac 0	50	100	Average
	-----pounds forage per acre-----			
0	8269	9300	9828	9132
50	8766	9208	9543	9171
100	9455	9817	10488	9920
Average	8830	9442	9953	

Table 4. Botanical composition of overseeding mixtures on Coastal bermudagrass, 1983

Mixture with Coastal	March 3 Cl:WG:C:W[1]	April 21 Cl:WG:C:W	May 25 Cl:WG:C:W	June 26 Cl:WG:C:W
Ryegrass	2:83:12:3	3:93:3:1	0:30:65:5	0:0:100:0
Yuchi	24:19:56:1	57:37:2:4	52:0:33:15	16:0:84:0
Ryegrass + Yuchi	15:35:48:2	41:57:2:0	35:21:44:0	21:0:79:0

[1]Ratio (Percentage) of Cl(clover), WG(winter grass), C(Coastal), and W(weeds).

Table 5. Forage yield of sodseeded mixtures with Coastal, 1982-83

Mixture with Coastal	pounds of dry forage per acre		
	1982	1983	Average
Ryegrass	15,400 a	10114 a	12757 a
Yuchi clover	14,678 a	9675 ab	12176 ab
Ryegrass + Yuchi	13,386 b	8769 b	11078 b
Coastal alone	12,561 c	10630 a	11596 b