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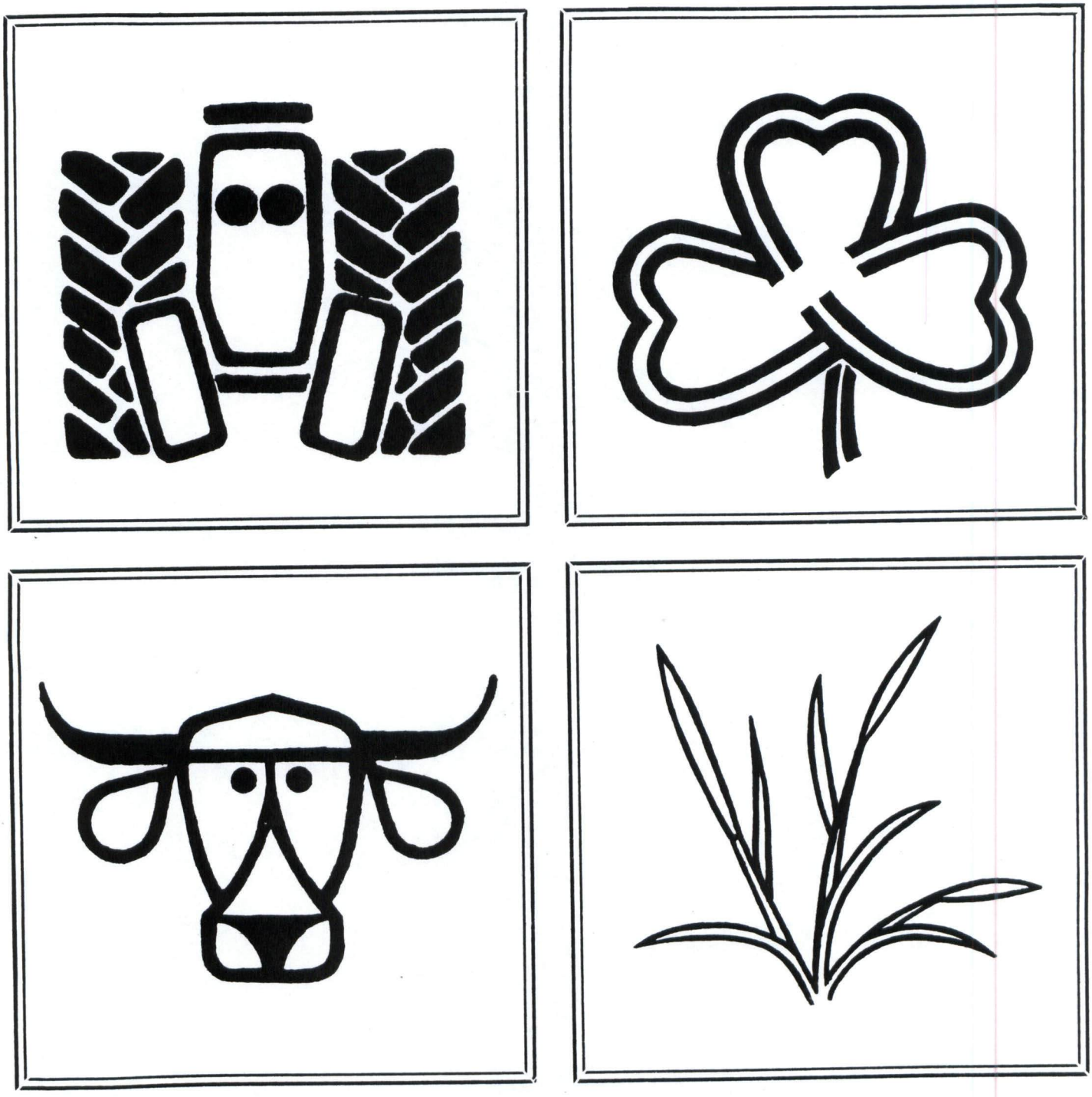

Forage Research in Texas

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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 early spring production about 3,000 pounds per acre. Late spring production of mixtures, harvested June 1, consisted of 50% Coastal with the total yield less than for Coastal alone. Summer production of Coastal, following sod seeding, was less than summer growth of non-overseeded Coastal. Apparently the spring crop reduced the ground cover of Coastal or removed some soil moisture or both, thereby reducing summer growth. Spring production of the three mixtures was about the same with each component producing less when in mixture together than when overseeded separately.

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

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KEY WORDS: Sod-seeding, Gulf ryegrass, Yuchi arrowleaf clover, Competition, Component yield.

MATERIALS AND METHODS

Gulf ryegrass and Yuchi arrowleaf clover were overseeded separately and in a mixture together on Coastal bermudagrass in October 1981. 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 about June 1, except that Yuchi alone was to receive 0, 25 and 50 at planting. Actually an error was made in the fall application and only 0, 17 and 33 (0, 8 and 17 on Yuchi) were applied.

Gulf ryegrass was seeded at 30 pounds per acre and Yuchi clover at 20 pounds per acre. Rescue and some ryegrass volunteered throughout the plot area resulting in wintergrass mixture in the Yuchi plots. A replicated check plot with three spring nitrogen rates (0, 50, 100 pounds per acre) was provided by desiccating all winter crop growth in early spring.

RESULTS

Good stands were obtained from fall overseeding on Coastal bermudagrass sod. Approximately 3,000 pounds of dry matter were produced by early April (Table 1). Total yields including bermudagrass production in the summer averaged 14,000 pounds per acre.

Gulf ryegrass and Yuchi clover, overseeded separately on Coastal, produced about the same amount of forage (Table 2). The combination of ryegrass and Yuchi produced a little less than either alone. The yield difference occurred at the August harvest and is not explainable. Summer yields of Coastal were less in plots that had been overseeded than in non-overseeded plots. The poor October yield of Coastal alone also is not explainable since all other plots also consisted of only Coastal in both August and October.

Forage yield by components of the mixtures is shown in Table 3 and summarized in Table 4. Ryegrass and rescue volunteered in all plots so there was not a true Yuchi clover alone treatment. The Coastal alone plots were treated with paraquat to remove the wintergrass. There was very little Coastal bermudagrass growth present in early April (Table 4). Wintergrass constituted 96% of the yield in ryegrass overseeded plots but only 73% in ryegrass-Yuchi plots. Thus, Yuchi did compete with the wintergrasses. Similarly Yuchi contributed 44% of the yield in Yuchi overseeded plots where ryegrass was not seeded but only 25% where ryegrass was added indicating significant competitive effects on Yuchi. Total yield of the mixtures in April differed by 375 pounds per acre. Similar competition patterns were observed at the June harvest where Coastal constituted 50% of the production.

The mixture data show that the overseeded and volunteer winter crops produced about 3,000 pounds of dry matter by early April and contributed another 1,000 to 1,800 pounds by the end of May. However, Coastal alone produced about 700 pounds more forage by June 1 than the mixtures on that date indicating that late spring production of the winter crops is not as good as Coastal. The after effects of the winter crop competition on Coastal are shown in Table 2.

Fertilization showed very limited effects (Table 5), probably for several reasons. Fall fertilization was planned at rates of 0, 25 and 50 pounds of nitrogen per acre on Yuchi and 0, 50 and 100 pounds on ryegrass and ryegrass + Yuchi. Through an error only one-third of those amounts was actually applied. Responses to the actual amounts applied were probably too low to measure. The plots were in a pasture that had been grazed for several years with an annual application of 200 pounds of nitrogen per acre. There may have been some build-up of nitrogen on this clay soil since this amount of nitrogen would not have been removed through the grazing animals. Coastal alone showed a significant response to the first increment of nitrogen but showed no further response to additional nitrogen applications.

Table 1. Total forage yield of sod-seeded mixtures on Coastal bermudagrass, 1982.

Mixture	Nitrogen, lb/acre Fall	Spring	Pounds of dry forage per acre Apr 14	Jun 1	Aug 3	Oct 18	Total
Ryegrass	0	0	3669	4388	3433	3794	15284
		50	2950	4314	3562	3012	13838
		100	3877	3311	3888	3770	14846
	17	0	3293	4408	3363	3790	14854
		50	3432	4923	5114	3708	17177
		100	3107	4815	4929	3618	16469
	33	0	3372	4788	3706	3236	15102
		50	3919	3972	3932	3290	15113
		100	3650	4368	4367	3720	16105
Yuchi	0	0	3291	4814	5035	4038	17178
		25	2994	4866	5310	3916	17086
		50	3178	4298	3644	2614	13734
	8	0	3276	4690	3619	3361	14946
		25	2664	4415	3796	3242	14117
		50	3730	4291	2369	3232	13622
	17	0	2924	5000	3687	3167	14778
		25	3028	4697	3828	3552	15105
		50	2835	4221	5182	3835	16073
Ryegrass & Yuchi	0	0	3252	4222	2025	2510	12009
		50	3378	3616	2974	3074	13042
		100	3368	4604	4775	3611	16358
	17	0	3122	4290	2772	2985	13169
		50	3503	4054	2780	2784	13121
		100	2977	3093	2314	2912	11296
	33	0	3220	3884	2098	2685	11887
		50	3042	4218	2636	3824	13720
		100	3283	4656	3579	4348	15866

Table 2. Average forage yield of various winter overseedings with Coastal bermudagrass, 1982.

Mixture with Coastal	Total dry matter yield Apr 14	Jun 1	Aug 4	Oct 18	Total
Ryegrass	3475 a[1]	4344 b	4032 b	3549 a	15,400 a
Yuchi clover	3102 b	4088 c	4052 b	3436 a	14,678 a
Ryegrass and Yuchi	3238 ab	4071 c	2884 c	3193 a	13,386 b
Coastal alone	100 c	5105 a	5464 a	1892 b	12,561 c

[1] Yields in the same column followed by a common letter are not significantly different ($P < 0.05$).

Table 3. Forage yields and ratios of mixture components, 1982.

Mixtures	Nitrogen (lb/ac) Fall	Spring	April 14 Lb./acre Clover	Winter grass	Coastal	Ratio Cl:WG:Co	June 1 Lb./acre Clover	Winter grass	Coastal	Ratio Cl:WG:Co
	0	0	0	3801	20	0:99:1	0	1653	2700	
		50	0	2856	318	0:90:10	0	1412	2017	
		100	0	4337	104	0:98:1	0	1216	1526	
	17	0	0	2598	161	0:94:6	0	1456	2406	
		50	0	3080	145	0:96:4	0	1502	3243	
		100	0	2902	74	0:98:2	0	2250	2480	
	33	0	0	3300	123	0:96:4	0	1474	3178	
		50	0	3560	231	0:91:9	0	1538	2518	
		100	0	3736	7	0:100:0	0	2293	1830	
Yuchi	0	0	1082	1651	39	39:60:1	2328	1097	557	
		25	2050	548	100	76:20:4	1434	1050	2150	
		50	1580	1124	55	57:41:2	654	954	2582	
	8	0	1437	1796	78	43:54:3	1404	295	2526	
		25	1193	1518	118	42:54:4	1791	909	1580	
		50	544	2973	16	15:84:1	382	1551	1813	
	17	0	1358	1478	72	50:48:2	561	1495	2728	
		25	927	1962	54	31:67:2	488	1762	2339	
		50	916	287	227	64:20:16	1488	309	2350	
Ryegrass & Yuchi	0	0	1020	2606	72	28:70:2	627	1601	1917	
		50	1387	2930	75	32:67:1	80	1774	2056	
		100	413	3006	146	12:84:4	0	2135	2610	
	17	0	1331	1900	35	41:58:1	0	2250	1977	
		50	1234	2329	52	34:64:2	0	1310	2524	
		100	628	2177	99	22:75:3	265	1617	1368	
	33	0	1020	2248	141	30:66:4	307	1744	1906	
		50	1387	1929	67	41:57:2	422	1485	2093	
		100	111	3346	73	3:95:2	136	2697	2133	

Table 4. Average forage yields and ratios of mixture components, 1982.

Mixture with Coastal	April 14 Clover	April 14 Winter grass	April 14 Coastal	April 14 Ratio Cl:WG:Co	June 1 Clover	June 1 Winter grass	June 1 Coastal	June 1 Ratio Cl:WG:Co
		lb/ac[1]				lb/ac		
Ryegrass	0	3352 a	132 a	0:96:1	0	1699 a	2385 a	0:42:58
Yuchi	1232 a	1481 c	84 a	44:53:3	1102 a	1043 b	2158 a	26:24:50
Ryegrass & Yuchi	838 b	2497 b	84 a	25:73:2	204 b	1846 a	2065 a	5:45:50

[1] Yields in the same column followed by a common letter are not significantly different ($P < 0.05$).

Table 5. The influence of nitrogen on forage yield of winter overseeding - Coastal bermudagrass mixtures and Coastal alone.

Time and rate of N (lb/ac)		Pounds of dry forage per acre				
Fall	Spring	April 14	June 1	August 4	October 18	Total
			Mixtures			
0	0	3404	4475	3498	3447	14824 ab[1]
	50	3107	4265	3949	3334	14656 ab
	100	3475	4071	4102	3332	14980 ab
17	0	3230	4463	3251	3379	14323 ab
	50	3200	4407	3896	3245	14665 ab
	100	3272	4066	3204	3254	13796 b
33	0	3172	4576	3164	3029	13923 b
	50	3330	4296	3465	3556	14660 ab
	100	3256	4415	4376	3968	16015 a
			Coastal alone			
0	0	82	5609	5331	1892	12914 c
	50	129	6536	9294	2378	18337 a
	100	83	4688	9593	1751	16115 a

[1] Values followed by the same letter are not significantly different ($P < 0.05$).