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John A. Guretzky

University of Nebraska-Lincoln, jguretzky2@unl.edu

Twain Butler

The Samuel Roberts Noble Foundation, Ardmore, OK

Matt Mattox

The Samuel Roberts Noble Foundation, Ardmore, OK

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Forage potential of temperate legumes with perennial grasses in the Southern Plains

John A. Guretzy, Twain Butler and Matt Mattox

The Samuel Roberts Noble Foundation, 2510 Sam Noble Parkway, Ardmore, Oklahoma 73401 USA

Eastern gamagrass before seeding legumes in September



Sweetclover and eastern gamagrass the following June



Arrowleaf clover and eastern gamagrass in June



Hairy vetch dominance of tall fescue in March



Button medic and tall fescue in March



INTRODUCTION

Rising costs of N fertilizer coupled with evidence of improved forage production and quality has increased interest among beef cattle producers in legume-grass mixtures for pasture.

Our objectives were to evaluate forage yields of temperate legumes seeded with perennial grasses in the Southern Plains. Replicated field trials were established in 2006 at Burneyville, OK; Vashti, TX; and Stephenville, TX, to evaluate potential legume dry matter (DM) yields under different soil and rainfall regimes.

MATERIALS AND METHODS

Burneyville. Legumes were broadcast-seeded and lightly raked by hand within individual 3 x 5 m plots in an existing stand of eastern gamagrass (*Tripsacum dactyloides*) on 25 Sept. 2006. Before seeding, the eastern gamagrass stand was mowed and baled to a 20-cm height. Diammonium phosphate was applied at 112 kg ha⁻¹ on 3 Nov. 2006. Cumulative legume forage yields were determined by harvest of two 0.1-m² quadrats at a 2.5-cm height between the eastern gamagrass rows on 19 April, and 27 June 2007.

Vashti. Legumes were seeded at < 6.0-mm depth with a HEGE 500 drill into a clean-tilled seedbed along with 'Flecha' tall fescue (*Festuca arundinacea*) at 17 kg PLS ha⁻¹ on 4 Oct. 2006. Before planting, diammonium phosphate was incorporated into the soil at 112 kg ha⁻¹.

Grass and legume DM yields were determined by harvest of two 0.4-m² quadrats at 2.5-cm height on 23 Mar. 2007. Plots were grazed from April through May 2007 to allow for estimation of reseeding and persistence in spring 2008.

Stephenville. Legumes were seeded in individual plots at < 6.0-mm depth with a HEGE 500 drill into an existing switchgrass (*Panicum virgatum*) stand on 31 Oct. 2006. Before seeding, the switchgrass stand was mowed to a 5-cm height, and triple superphosphate was applied at 112 kg ha⁻¹. Forage DM was measured by clipping two 0.4-m² quadrats at 2.5-cm height from each plot when each legume species reached 50 percent bloom.

The trials were randomized complete block designs. Treatments were replicated four times, and data were analyzed with the GLM procedure in SAS (Statistical Analysis Software, Cary, NC). Significance was determined at *P* < 0.05.

RESULTS AND DISCUSSION

Burneyville. Legume DM on 19 April was best for annual medics, averaging 2835 kg ha⁻¹ for button medic, 3188 kg ha⁻¹ for 'Devine' little burr medic, 1547 kg ha⁻¹ for 'Euckert' burr medic, 2623 kg ha⁻¹ for Tifton burr medic and 925 kg ha⁻¹ for rigid medic (Table 1).

Between 19 April and 27 June, net DM accumulation was best for 'Madrid' yellow sweetclover, hairy vetch, the arrowleaf clovers and Austrian winter pea.

Red and white clover produced 1277 to 1546 kg ha⁻¹ of forage by 27 June. A soil pH of 8.3 may have limited clover success on this site.

Vashti. Legume DM was best for hairy vetch and Austrian winter pea, ranging from 3022 to 4109 kg ha⁻¹. Tall fescue DM was lowest, however, when seeded with hairy vetch.

Dry matter of annual medics, annual clovers, alfalfa and perennial clovers averaged 1047, 1224, 1145 and 304 kg ha⁻¹, respectively.

Stephenville. Legume forage yields were best for hairy vetch, Austrian winter pea and rose clover. Switchgrass yields, however, were lowest when hairy vetch and Austrian winter pea were seeded.

Dry matter of annual medics, annual clovers, alfalfa and perennial clovers averaged 440, 840, 255 and 363 kg ha⁻¹, respectively.

CONCLUSIONS

Hairy vetch and Austrian winter pea were among the best, if not the highest, forage producing legumes across all sites. Compatibility of these legumes with tall fescue and switchgrass, however, is questionable.

Research on legume persistence and reseeding under grazing will improve understanding of the value of different legumes for beef cattle production in the Southern Plains.

Table 1. Dry matter of temperate forage legumes and grasses at Burneyville, OK, Vashti, TX, and Stephenville, TX in 2007.

Common name	Cultivar/strain	Scientific name	Seeding Rate kg PLS ha ⁻¹	Burneyville Harvests			Vashti Harvests			Stephenville Harvests		
				Legume		Legume 3/23	Tall fescue 3/23	Total 3/23	Legume		Total Spring at 50% legume bloom	
				4/19	6/27				Net accumulation	Legume		Switchgrass
alfalfa	Alfagrazo	<i>Medicago sativa</i>	18			1145	803	1948	255	2600	2855	
arrowleaf clover	Apache	<i>Trifolium vesiculosum</i>	8	40	3764	3724	976	839	1813	1590	4461	
arrowleaf clover	Yuchi	<i>Trifolium vesiculosum</i>	8	0	4464	4464	1024	1151	2176	1174	2574	
Austrian winter pea	common	<i>Pisum sativum</i> subsp. <i>Arvense</i>	22	363	5781	5418	3022	1208	4231	3689	1110	4800
ball clover	common	<i>Trifolium nigrescens</i>	3	27	2191	2164	974	1243	2216	171	2466	2638
ball clover	Overton	<i>Trifolium nigrescens</i>	2	0	1640	1640	1033	766	1800	0	2523	2523
burr medic	Euckert	<i>Medicago polymorpha</i>	12	1547	3321	1774	1556	1440	2995	1200	1962	3163
button medic	NTClay	<i>Medicago orbicularis</i>	7	2488	6131	3642	931	1353	2283	1949	2322	4272
button medic	Estes	<i>Medicago orbicularis</i>	9	3484	4988	1504	1477	1279	2753	1813	3213	5028
button medic	SA2161	<i>Medicago orbicularis</i>	4	3013	3670	658				169	3400	3569
button medic	SA8273	<i>Medicago orbicularis</i>	4	2354	3966	1612				550	2043	2593
crimson clover	Dixie	<i>Trifolium incarnatum</i>	13	471	0	0	2110	1248	3358	329	2967	3296
crimson clover	Overton	<i>Trifolium incarnatum</i>	16	27	1398	1371	1326	1213	2539	295	2537	2831
hairy vetch	AU early cover	<i>Vicia villosa</i>	22	1789	5405	3616	3515	273	3788	2766	1569	4336
hairy vetch	VNS	<i>Vicia villosa</i>	22				4109	41	4151	3951	930	4881
kura clover	VNS	<i>Trifolium ambiguum</i>	14	13	0	0	24	2327	2350	144	4405	4549
little burr medic	Devine	<i>Medicago minima</i>	9	3188	4141	953	1074	1468	2544	421	3286	3706
red clover	Bouton	<i>Trifolium pratense</i>	13	0	1546	1546	660	1204	1863	648	3265	3912
rigid medic	227850	<i>Medicago rigiduloides</i>	12	0	457	457	1018	1306	2324	0	3526	3527
rigid medic	230350	<i>Medicago rigiduloides</i>	11	135	834	820	1673	673	2346	0	3005	3005
rigid medic	441963	<i>Medicago rigiduloides</i>	8	955	1896	1264	958	1191	2149	48	3493	3541
rigid medic	495457	<i>Medicago rigiduloides</i>	9	1681	2017	537	479	1441	1921	141	2438	2579
rose clover	Overton R18	<i>Trifolium hirtum</i>	7	1856	3159	1303	1071	877	1948	3158	2482	5640
subterranean clover	Denmark	<i>Trifolium subterraneum</i>	12	27	0	0	1280	1434	2714	0	3658	3658
Tifton burr medic	495462	<i>Medicago rigidula</i>	10	2233	3509	1276	1029	1398	2418	0	3398	3398
Tifton burr medic	495523	<i>Medicago rigidula</i>	11	3040	3630	590	701	1341	2042	75	3520	3596
Tifton burr medic	495552	<i>Medicago rigidula</i>	12	2179	2998	819	512	1194	1707	193	2854	3046
Tifton burr medic	495555	<i>Medicago rigidula</i>	11	2623	2770	147	1462	1198	2660	37	3353	3390
Tifton burr medic	495556	<i>Medicago rigidula</i>	12	3040	2595	0	755	1960	2714	155	3500	3655
white clover	Durana	<i>Trifolium repens</i>	3	0	1277	1277	230	1776	2006	296	2874	3170
yellow sweetclover	Madrid	<i>Mellilotus officinalis</i>	11	780	8873	8093						
white sweetclover	TX-sc-2022-10	<i>Mellilotus officinalis</i>	11	229	3213	2985						
white sweetclover	TX-sc-2022-32	<i>Mellilotus officinalis</i>	11	202	2675	2474						
		LSD		1182	2193	2208	708	574	987	885	1428	1559

Gray shaded numbers are not statistically different from the highest-yielding variety within a column, with the exception of the teal shaded numbers. Green shaded numbers indicate statistically lower grass DM producing treatments.