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Mississippi *Perennial Cool-Season* FORAGE CROP

VARIETY TRIALS, 2013

MAFES

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Trade names of commercial and public varieties tested in this report are included only for clarity and understanding. All available names (i.e., trade names, experiment code names or numbers, chemical names, etc.) and varieties, products or source seed in this research are listed on page 9.

Mississippi Perennial Cool-Season Forage Crop Variety Trials, 2013

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Introduction

Varieties of forage crops are evaluated every year in Mississippi Agricultural and Forestry Experiment Station small-plot trials. Seed for the entries are provided by seed companies and state universities and tested at one or more locations across Mississippi. All entries from privately owned companies are tested on a fee basis. MAFES added standard varieties as a reference for comparison purposes. In addition, varieties of interest were also added when applicable. Seed sources are presented in Table 15. This report contains data on 11 varieties of tall fescue (*Festuca arundinacea*), 17 varieties of perennial clovers (white clover, *Trifolium repens*; red clover, *Trifolium pretense*), and 6 varieties of alfalfa (*Medicago sativa*). Tall fescue entries include endophyte-infected, endophyte-free, and novel-endophyte types. Alfalfa entries include both Roundup Ready® and conventional varieties, and the perennial clover trial includes red and white clovers. Locations include North Mississippi Branch Experiment Station at Holly Springs, Leveck Animal Research Center Forage Unit at Starkville, and White Sands Research Unit at Poplarville. Perennial clover and alfalfa were planted in fall 2011 at Holly Springs, Starkville, and Poplarville. Due to insufficient stands of perennial clover and alfalfa in Poplarville and Holly Springs, trials in both locations were replanted in fall 2012. Tall fescue was planted in fall 2011 at Starkville and Holly Springs, the two most northern locations. Red clover entries did not survive the summer in Starkville and had to be replanted in fall 2012. Growth was not sufficient enough to justify a harvest in the fall for red and white clover. Alfalfa in Starkville was severely infected with crown rot by September 2012 due to cool, wet conditions early in the fall preceded by persistent summer rains late in the summer. Climate data by location is presented in Tables 1 and 2.

Data presented in Tables 4–14 can be used to evaluate the performance of each forage variety or species within that test. Comparisons can be statistically evaluated by using the LSD (least significant difference). The LSD represents the amount of yield that must be observed between any two varieties to determine if the differences observed were due to variety variation alone. Coefficient variation (CV) describes the accuracy of the test compared to other tests. Highly variable trials between replications will be reflected in a high CV.

Table 1. Monthly rainfall totals for Poplarville, Starkville, and Holly Springs in 2013.

Location	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	in	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*	*in*
Poplarville	8.95	6.78	1.56	8.28	4.89	4.13	8.25	6.05	—	1.27	3.66	—
Starkville	8.49	3.98	5.66	7.19	7.23	2.76	4.00	2.27	4.90	3.20	5.08	4.95
Holly Springs	8.38	4.33	4.90	6.38	7.23	4.77	2.80	1.05	5.19	5.77	1.88	5.61
MS 30-yr. avg.	5.30	4.70	5.80	5.60	5.10	3.30	4.50	3.80	3.60	3.30	4.80	5.90

Table 2. Mean high and low temperatures by month for Poplarville, Starkville, and Holly Springs in 2013.

Location	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
Poplarville												
High	62	63	65	75	80	90	87	88	—	79	64	—
Low	44	43	42	54	61	70	70	71	—	59	45	—
Starkville												
High	55	56	59	72	79	89	89	90	88	74	60	53
Low	33	32	33	47	55	66	65	66	64	51	36	33
Holly Springs												
High	53	53	57	72	78	86	86	87	85	72	58	52
Low	32	31	32	45	55	64	65	65	60	49	33	31
Mississippi 30-year average												
High	56	60	69	77	83	90	92	92	87	78	68	59
Low	34	37	45	52	61	68	71	70	65	52	43	37

Protocol

Tall fescue, perennial clovers, and alfalfa trials across the state were established during October 4 to 9, 2011. Soil samples from each location were taken and analyzed by Mississippi State University Soil Testing Lab. Each trial area was fertilized with lime, phosphorus (P_2O_5), and potassium (K_2O) according to the soil sample recommendation. Recommendations for phosphorus and potassium in grass were usually fulfilled with one application of 15-5-10. Tall fescue trials were fertilized with 335 pounds per acre of 15-5-10 at planting, followed by 50 pounds per acre of N using urea ammonium sulfate (33-0-0S) after each harvest. Perennial clover and alfalfa trials were fertilized with 100 pounds of 0-0-60 at planting and an additional 100 pounds per acre of phosphorus and potassium early in the spring using 0-20-20. Plot dimensions were 6 by 11 feet and planted using a precision cone seeder on a prepared seedbed. The experimental design was a randomized complete block replicated four times. Recommended seeding rates for individual trials were utilized using pure live seed (PLS) (Table 3). All grass plots were harvested when 75% of the plots achieved 15 inches of growth. Alfalfa was harvested at 50% bloom, and clovers were harvested when 75% of plots were 10–15 inches in height. Perennial clovers, alfalfa, and tall fescue were harvested to a stubble height of 4 inches. Plots were harvested using a Ferris "Zero-Turn" mower with a bagging system collecting a 4.3-by-11-foot swath to calculate total yield. A subsample was collected and dried at 131°F to calculate dry matter percentage (DM). Data were analyzed using the general linear model (PROC GLM) of SAS, and mean separation was conducted using the least significant difference (LSD) at $\alpha = 0.05$.

Table 3. Seeding rates used in 2013 variety trials.

Variety	Seeding rate (PLS[1])
	lb/A
Alfalfa	20
Red Clover	12
Tall Fescue	20
White Clover	3

[1]PLS = Pure Live Seed.

Alfalfa

Alfalfa is a perennial legume common in the Midwest and North. Alfalfa varieties have been bred for more southern climates, but stand persistence can be a problem. Several diseases and pests, such as crown rot (*Sclerotinia trifoliorum)*, stem rot (*Phytophthora medicaginis*), alfalfa weevil (*Hypera hostica*), and leafhoppers (*Empoasca solana*), are a major problem. Alfalfa is also very sensitive to soil pH and should be maintained at 6.5 or greater. Alfalfa needs 65 pounds of P_2O_5 and 350 pounds of K_2O per acre as fertilizer input. Planting should take place between September and October at a seeding rate of 20 pounds per acre on a firm seedbed. Most of the yield distribution for alfalfa is in early summer to early fall. Protein content of alfalfa ranges from 12–18%; acid detergent fiber (ADF), 30–40%; and neutral detergent fiber (NDF), 40–50%. Alfalfa can also be successfully established in warm-season sod grasses to increase hay quality and yield distribution, especially in low-nitrogen-input situations.

Table 4. Dry matter yields for alfalfa varieties in Holly Springs, 2013.[1]

Variety	5/29/13	6/26/13	11/5/13	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Alfalfagraze 600RR	2762	1840	1052	5655
Ameristand 815TRR	2590	1575	1133	5299
Bulldog 505	2275	1903	1046	5224
DKA41-18RR	2488	1760	912	5159
DKA65-10RR	1850	1838	1255	4943
DKA84-10	2986	1447	1166	5599
Mean	2492	1727	1094	5313
$LSD_{0.05}$	NS	NS	NS	NS
CV%	22	19	17	22

[1]NS = not significant
Planted: September 28, 2012 Soil: Grenada silt loam
Fertilized: 315 pounds per acre of 0-0-60 at midseason Lime: 1 ton per acre at planting
Herbicide: 1 pint per acre of Paraquat after each harvest; 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest

Table 5. Dry matter yields for alfalfa varieties in Starkville, 2013.[1]

Variety	5/21/13	8/26/13	Total
	lb/A	*lb/A*	*lb/A*
Alfalfagraze 600RR	2042	1529	3571
Ameristand 815TRR	1993	1227	3220
Bulldog 505	1970	1577	3547
DKA41-18RR	2035	1812	3847
DKA65-10RR	2136	1302	3438
DKA84-10	1999	1441	3441
Mean	2029	1481	3511
$LSD_{0.05}$	NS	NS	NS
CV%	26	20	18

[1]NS = not significant
Planted: November 1, 2012 Soil: Marietta fine sandy loam
Fertilized: 315 pounds per acre of 0-0-60 at end of season
Herbicide: 1 pint per acre of Paraquat after each harvest; 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest

Table 6. Dry matter yields for alfalfa varieties in Poplarville, 2013.[1]

Variety	4/13/13	5/28/13	6/20/13	8/7/13	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Alfalfagraze 600RR	2192	1540	1475	1465	6673
Ameristand 815TRR	2327	1491	1882	1353	7052
Bulldog 505	2363	1532	1594	1747	7237
DKA41-18RR	1393	1414	1740	1442	5989
DKA65-10RR	2479	1549	1760	1478	7266
DKA84-10	2094	1251	1538	1273	6157
Mean	2141	1463	1665	1460	6729
$LSD_{0.05}$	NS	NS	NS	290	NS
CV%	29	19	15	13	12

[1]NS = not significant
Planted: October 12, 2012 Soil: Basin loam
Fertilized: 315 pounds per acre of 0-0-60 at midseason Lime: 1 ton per acre at planting
Herbicide: 1 pint per acre of Paraquat after each harvest; 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest

Perennial Clover

Red clover is a short-lived perennial in Mississippi, rarely surviving the summers. In central to southern Mississippi, it should be treated as an annual. Red clover tolerates wet, acidic soils and withstands shading in the seedling stage, which gives it potential to be overseeded in sod grasses. When seeding it in an established pasture system, it is best to plant between October 15 and November 20. In grass mixtures, plant 4–8 pounds per acre, but in pure stands, 12 pounds per acre will be sufficient. Red clover does well with 60 pounds of P and 40 pounds of K per acre and a pH above 5.5. Two to three harvests can be expected if cutting for hay in late spring to early summer.

White clover is much more persistent than red clover, but yields are typically less. It does offer more opportunity in grazing situations than in hay harvest because of its prostrate growth habit. White clover is tolerant of wet soils and prefers a pH of 6. Plant white clover at 3–4 pounds per acre in pure stands or 2–3 pounds per acre in mixtures between September and October. White clover is responsive to K, and a starter fertilizer of 20-60-20 will aid in establishment. Like red clover, white clover acts as an annual in the southern part of the state but has a greater reseeding potential. Both species of clover have excellent forage quality, but white clover tends to have a greater potential to cause bloat. When grazing white clover, it is recommended to interseed with grass to reduce bloat potential.

Table 7. Dry matter yields for perennial clover varieties in Holly Springs, 2013.[1]

Variety	5/29/13	6/26/13	11/5/13	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Red clover				
Barduro	2658	671	1334	4663
Southern Belle	2121	1783	724	4629
White clover				
Neches	1811	1879	449	4138
Ocoee	1849	1076	578	3502
Mean	2110	1352	771	4233
$LSD_{0.05}$	NS	585	482	NS
CV%	11	27	39	21

[1]NS = not significant
Planted: September 28, 2012 Soil: Grenada silt loam
Lime: 1 ton per acre at planting
Herbicide: 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest

Table 8. Dry matter yields for perennial clover varieties in Starkville, 2013.[1]

Variety	5/6/13	6/12/13	Total
	lb/A	*lb/A*	*lb/A*
Red clover			
Barduro	833	533	1367
Cinamon+	978	965	1942
FLMD	1065	773	1838
Morningstar	988	895	1882
PGI33	987	825	1811
Rustler	961	770	1732
Southern Belle	774	761	1534
TXRC-05	1444	1015	2459
White clover			
Barablanca	1119	1332	2451
Chickasaw	1558	1419	2977
Companion	1605	1455	3060
Neches	1423	1682	3106
Ocoee	1433	1446	2880
OR46	1335	1453	2788
Patriot	1680	1587	3267
Regalgraze	1632	1474	3106
Resolute	1661	1672	3333
Mean	1263	1180	2443
$LSD_{0.05}$	555	313	738
CV%	31	19	21

[1]Planted: October 6, 2011 Soil: Marietta fine sandy loam
Fertilized: 50 pounds per acre of 0-0-60 at planting; 100 pounds per acre of 0-20-20 in the spring
Herbicides: 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest; 1 pint per acre of Post (sethoxydim) after first harvest

Table 9. Total annual yields and the 2-year average for perennial clover in Starkville, 2012–2013.[1]

Variety	2012	2013	2-yr. avg.
	lb/A	*lb/A*	*lb/A*
Red clover			
Barduro	1932	1367	1649
Cinamon+	2504	1942	2223
FLMD	2019	1838	1928
Morningstar	2141	1882	2012
PGI33	2263	1811	2037
Rustler	2372	1732	2052
Southern Belle	2062	1534	1798
TXRC-05	1730	2459	2094
White clover			
Barablanca	1979	2451	2215
Chickasaw	2067	2977	2522
Companion	1853	3060	2456
Neches	1937	3106	2521
Ocoee	1509	2880	2194
OR46	1907	2788	2347
Patriot	1542	3267	2404
Regalgraze	1175	3106	2141
Resolute	1223	3333	2278
Mean	1895	2443	2169
$LSD_{0.05}$	615	738	475
CV%	22	21	15

[1]Planted: October 6, 2011 Soil: Marietta fine sandy loam
Fertilized: 50 pounds per acre of 0-0-60 at planting; 100 pounds per acre of 0-20-20 in the spring
Herbicides: 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest; 1 pint per acre of Post (sethoxydim) after first harvest

Table 10. Dry matter yields for perennial clover varieties in Poplarville, 2013.[1]

Variety	4/13/13	5/28/13	6/20/13	Total
	lb/A	*lb/A*	*lb/A*	*lb/A*
Red clover				
Barduro	904	1355	922	3181
Southern Belle	2150	1487	959	4596
White clover				
Neches	2023	1606	797	4426
Ocoee	887	1570	934	3391
Mean	1491	1504	903	3898
$LSD_{0.05}$	340	NS	NS	NS
CV%	25	16	11	30

[1]NS = not significant
Planted: September 28, 2012 Soil: Basin loam
Lime: 1 ton per acre at planting
Herbicide: 4 ounces per acre of Pursuit (ammonium salt of imazethapyr) after first harvest

Table 11. Total annual dry matter yields of white and red clover pooled from across varieties in Holly Springs, Starkville, and Poplarville, 2013.[1]

Species	Holly Springs	Starkville	Poplarville
	lb/A	*lb/A*	*lb/A*
Red clover	3451	1820	3888
White clover	2905	2996	3908
Mean	3178	2408	3898
$LSD_{0.05}$	NS	260	NS
CV%	21	22	33

[1]NS = not significant

Tall Fescue

Tall fescue is a perennial grass with short rhizomes and is primarily grown in the northern part of the state. It does well on poorly drained soils, making it popular in lowland areas. Tall fescue should be established from September to October at a seeding rate of 15–20 pounds per acre. During the establishment year, avoid grazing below 4 inches to minimize stand failure. Tall fescue tolerates soil pH of 5.5–7.5 and responds well to nitrogen. Tall fescue requires 60–70 pounds per acre of phosphorus and potassium. Endophyte toxicity can be a problem. However, grazing management, the inclusion of clovers, and the use of novel-endophyte and endophyte-free varieties can be used to mitigate the harmful effects of the toxin.

Table 12. Dry matter yields of tall fescue varieties in Starkville, 2013.[1]

Variety	Type	3/7/13	4/15/13	5/16/13	9/13/13	11/4/13	Total
		lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
AGRFA 148	NE	2060	2332	2254	2973	3380	13112
BarOptima Plus E34	NE	2091	2494	2444	3095	3457	13279
Cowgirl	EF	2047	2403	2276	2705	2830	12419
Estancia	NE	1918	2604	2321	2474	3477	12598
Kentucky 31	EI	1532	1759	2177	2948	3427	13480
Max Q	NE	1797	2465	2088	2990	3758	14121
NFTF 1044	NE	2234	2770	2369	3079	3298	11845
NFTF 1051	NE	2213	2543	2128	3069	3031	12451
NFTF 1411	NE	2383	2515	2208	2868	3090	12802
Rustler	EF	1797	2700	2263	2774	3518	13177
Teton II	EF	2318	2390	2179	2826	3027	12882
Mean		2035	2452	2246	2891	3299	12924
$LSD_{0.05}$		NS	NS	NS	NS	401	NS
CV%		19	17	10	12	8	7

[1]NS = not significant, NE = novel endophyte, EF = endophyte free, EI = endophyte infected
Planted: October 8, 2011 Soil: Marietta fine sandy loam
Fertilized: 325 pounds per acre of 15-5-10 at planting; 50 pounds of N from urea ammonium sulfate after harvest
Herbicide: 1 pint per acre of Grazeon Next (aminopyralid + 2,4-D) at maturity; 4 ounces per acre of Banvel (dimethylamine salt of dicamba) at seedling stage

Table 13. Dry matter yields of tall fescue varieties in Holly Springs, 2013.[1]

Variety	Type	4/25/13	6/26/13	Total
		lb/A	*lb/A*	*lb/A*
AGRFA 148	NE	2686	3064	5750
BarOptima Plus E34	NE	1698	3313	5011
Cowgirl	EF	2353	3221	5574
Estancia	NE	2648	2959	5607
Kentucky 31	EI	2472	2898	5370
Max Q	NE	2523	2595	5118
NFTF 1044	NE	2262	2813	5075
NFTF 1051	NE	2839	2751	5590
NFTF 1411	NE	2762	2599	5361
Rustler	EF	2386	2760	5146
Teton II	EF	2838	2573	5411
Mean		2497	2868	5365
$LSD_{0.05}$		556	NS	NS
CV%		15	13	12

[1]NS = not significant, NE = novel endophyte, EF = endophyte free, EI = endophyte infected
Planted: October 8, 2011 Soil: Grenada Silt Loam
Fertilized: 325 pounds per acre of 15-5-10 at planting; 50 pounds of N per acre from urea ammonium sulfate after harvest
Herbicide: 1 pint per acre of Grazeon Next (aminopyralid + 2,4-D) at maturity; 4 ounces per acre of Banvel (dimethylamine salt of dicamba) at seedling stage

Table 14. Total dry matter yields of endophyte-infected tall fescue types from Starkville and Holly Springs pooled across varieties, 2013.[1]

Type	Starkville	Holly Springs
	lb/A	*lb/A*
Endophyte infected	11844	5369
Endophyte free	13189	5377
Novel endophyte	12964	5359
Mean	12665	5368
$LSD_{0.05}$	NS	NS
CV%	7	11

[1]NS = not significant

Table 15. Tall fescue, alfalfa, and clover seed sources, 2012.

Species	Variety	Company
Alfalfa	Alfalfagraze 600RR	Forage Genetics International
	Ameristand 815TRR	Forage Genetics International
	Bulldog 505	Athens Seed
	DKA41-18RR	Monsanto
	DKA65-10RR	Monsanto
	DKA84-10	Monsanto
White Clover	Barablanca	Barenburg USA
	Chickasaw	NA[1]
	Companion	Memphis Inc.
	Neches	Barenburg USA
	Ocoee	Allied Seed, LLC
	OR46	NA
	Patriot	Pennington Seed
	Regalgraze	CalWest Seed
	Resolute	Allied Seed, LLC
Red Clover	Barduro	Barenburg USA
	Cinamon+	Allied Seed, LLC
	FLMD	Barenburg USA
	Morningstar	NA
	PGI33	CalWest Seed
	Rustler	Oregro Seeds
	Southern Belle	Allied Seed, LLC
	TXRC-05	Agrilife Research
Tall Fescue	AGRFA 148	The Noble Foundation
	BarOptima PLUS E34	Barenburg USA
	Cowgirl	Rose Agri-Seed Inc.
	Estancia	Mountain View Seeds
	Kentucky 31	Starkville Coop
	Max Q	Pennington Seed
	NFTF 1044	The Noble Foundation
	NFTF 1051	The Noble Foundation
	NFTF 1411	The Noble Foundation
	Rustler	Grassland Oregon Inc.
	Teton II	Mountain View Seeds

[1]NA = Seed supplied by the Mississippi State University Forage Variety Testing seed inventory

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