MISSISSIPPI COVER CROP

VARIETY TRIALS, 2020

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MISSISSIPPI'S OFFICIAL VARIETY TRIALS

MISSISSIPPI STATE UNIVERSITY™
MS AGRICULTURAL AND
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This report contains data generated as part of the Mississippi Agricultural and Forestry Experiment Station. Joint sponsorship by the organizations listed on Page 8 is gratefully acknowledged.

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 8.

Mississippi Cover Crop Variety Trials, 2020

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Recognition is given to student worker Joey Hester for his assistance in cultivating, packing, planting, harvesting, and recording plot data.

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Find variety trial information online at ***mafes.msstate.edu/variety-trials***.

Mississippi Cover Crop Variety Trials, 2020

Introduction

Many seed companies and retailers that specialize in forage crops have expanded some of their products to act as cover crops. Cover crops are typically planted before a grain crop for several reasons. Cover crops can provide and stabilize N for the subsequent crop and add organic matter to the soil or increase weed suppression during the off-season. Cover crops can also add root structure and ground cover to hold soil in place during rainfall, increasing the overall quality of the soil for the following crop. While legumes are valued for their ability to add nitrogen to the soil through fixation, grass crops can have an allelopathic effect on invasive weed species, which can help to control them.

Protocol

Varieties of several cover crops species were evaluated during 2019–2020 in Mississippi Agricultural and Forestry Experiment Station (MAFES) small-plot trials. Entries were submitted by seed companies as well as breeding programs at state universities. All entries from privately owned companies are tested on a fee basis. Selected varieties that are publicly or commercially available may have been added by the MAFES Forage Variety Testing program as a reference check for comparison purposes. In addition, varieties of interest to the region may also be added when applicable. Testing during 2019–2020 was conducted at the following locations: Forage Unit of the Leveck Animal Research Center at Mississippi State campus in Starkville, Coastal Plain Branch Experiment Station at Newton, and the Northeast Mississippi Branch Experiment Station in Verona. Due to stand failure and inadequate germination caused by extreme flooding at Newton and Verona, the Starkville location is the only one reported in this publication.

Table 1. Recommended seeding rates for cover crops.

Type/Species	Rate (lb/A)
Small Grains	
Cereal Rye	100
Annual Ryegrass	30
Legumes	
Hairy Vetch	25
Berseem	20
Balansa	4
Ball	3
Crimson	30
Persian	8
Winter Pea	40
Red Clover	10
Brassica	
Radish	4
Turnip	4

The cover crop trial was planted at all locations in the first week of November 2019. The late planting date was due to greater than normal precipitation during the typical fall planting months possibly effecting biomass accumulation by the termination dates. Plots were 6 feet x 10 feet and planted using a precision cone seeder on a prepared seedbed. Each trial was designed as a strip plot replicated three times with harvest date representing a single strip. Recommended seeding rates were used and are presented in Table 1. Individual strips were harvested March 15 and April 1 to best represent cover crop incorporation before corn production in

Mississippi. At harvest, a visual weed suppression rating was performed using a 1–10 rating. A rating of 1 described a plot that was mostly all weeds and had very little planted cover crop present within the harvested biomass. A visual rating of 10 characterizes a plot that is 100% of the intended cover crop. A visual rating of less than 7 would be considered to have a significant portion of the analyzed biomass to be plants other than the intended cover crop (Table 2–3).

All plots were harvested to a 3-inch stubble height. Plots were harvested using a Winterstieger equipped with a forage Cibus F plot harvester reel type header that collected a 4.8-foot x 10-foot swath to calculate total yield. A subsample was collected and dried at 140 °F until constant weight was achieved to calculate dry matter (DM) concentration. Forage quality was estimated using NIR (Foss 2500, Foss North America, Eden Prairie, Minnesota) and the 2018 mixed hay equation of the NIRS Forage and Feed Testing Consortium (Madison, Wisconsin). Data was used to populate a "Nitrogen Availability Calculator" Model (http://aesl.ces.uga.edu/mineralization/) developed by the University of Georgia College of Agriculture and Environmental Sciences (Athens, Georgia) to report estimated N availability after 2 weeks, 4 weeks, and 3 months post termination (Tables 4–5). Economic data (Table 6) was calculated using local (Mississippi) retail cost of seed from two sources per variety with that cost added to a fixed planting cost of $13 per acre (Falconer et al., 2016). Nitrogen value was presented as a national average value and data were analyzed using the General Linear Model (PROC GLM) of SAS and mean separation was conducted using LSD at $\alpha = 0.05$.

Data presented in Tables 2–5 can be used to evaluate the performance of each forage crop within its respective trial. Mean and harvest comparisons were evaluated statistically by using the least significant difference (LSD) test at the probability level of $\alpha = 0.05$. The LSD value represents the minimum amount of yield that must be observed between any two varieties to determine if the difference was due to variety variation alone. Sources of seed are presented in Table 7.

Results

Overall, weed suppression was increased when harvest was delayed, suggesting that the planted cover crop comprised most of the harvest yield except for Winter pea, 'Balady' berseem, 'Vivant' turnip, all hairy vetch entries, and 'SECCM18' crimson entries. These entries rated a 7 or below in the April 1 harvest, suggesting a considerable influence on dry matter yield and N availability (Table 2–3).

Dry matter yields during the first harvest were consistently the greatest with cereal rye varieties (Table 3). By the second harvest, ryegrass and cereal rye produced the greatest dry matter yields (Table 2), except for 'Low Boy' ryegrass, which is advertised as a turf grass; therefore, it exhibited excellent weed suppression but very little biomass growth.

On average, 40% greater total nitrogen was produced when crop termination was delayed for 2 weeks. This increasing trend was evident in all species, except for cereal rye, which decreased in total nitrogen due to over maturity. However, the greatest producers of 2 weeks, 4 weeks, 3 months, and total N in the first harvest was 'Winter Grazer 70' cereal rye and Vivant hybrid turnip (Table 4). By the second harvest, 'Fixation' balansa produced one of the greatest amounts of N at all time intervals, which accumulated to 142 pounds per acre, well above the mean of nearly 70 pounds (Table 4). Total N was comparable during the first harvest among species except for hairy vetch, which produced the lowest amount of total N during the first harvest. By the second harvest, balansa and red clover had the potential to contribute the greatest amounts of total N (Table 5).

When considering total N as the sole variable of interest and market N valued at $0.43 per pound as of April 2019, planting cost were greater than the potential N return for all entries when terminated by March 15 (Table 6). However, when termination was delayed for 2 weeks several varieties had the potential of positive returns for N. Legumes such as Fixation balansa, crimson clovers ('Dixie II,' 'Blaza,' and SECCM18), and 'Au Red Ace' red clover had positive returns of over $20 per acre in N value. Fixation balansa had the greatest potential return with over $50 in total N value.

Table 2. Weed suppression and dry matter yields of cover crop varieties at two termination dates in Starkville, Mississippi.

Variety	Species	March 15 termination		April 1 termination	
		Weed suppression	Dry matter yield	Weed suppression	Dry matter yield
		Rating[1]	*lb/A*	*Rating*	*lb/A*
Bates RS4	Rye	10	2992	10	5753
NF97325	Rye	9	3418	10	6465
NF95319B	Rye	9	2252	9	3667
NF99362	Rye	9	2842	9	5067
Elbon	Rye	9	985	9	3158
Dixie II	Crimson	8	409	8	2830
Vivant Hybrid Turnip	Turnip	8	1033	6	1725
Centurion	Ryegrass	10	1400	10	4266
Aerifi	Radish	8	1531	8	2363
Jackpot	Turnip	9	977	8	2766
AU Sunrise	Crimson	8	582	8	2300
WinterGrazer70	Rye	9	1632	10	5111
Blaza	Crimson	6	396	8	2476
Super 10	Berseem	8	427	9	2063
Au Red Ace	Red Clover	6	444	9	2106
AU Merit	Hairy Vetch	3	130	6	1624
WinterKing	Hairy Vetch	5	254	7	1741
Patagonia Inta	Hairy Vetch	5	127	6	2385
SEBCB19	Berseem	6	328	9	2320
Balady	Berseem	5	265	7	2971
Low Boy	Ryegrass	8	130	10	613
Gulf	Ryegrass	10	806	10	5493
CCS 779	Radish	8	1204	8	2749
SECCB18	Crimson	6	499	8	2003
SECCM18	Crimson	6	193	5	2302
SERWF19	Radish	5	878	9	1901
Dixie	Crimson	8	473	9	2249
Survivor	Winter Pea	1	—	7	1964
Driller	Radish	5	886	8	2470
Fixation	Balansa	7	350	10	2445
Frosty	Berseem	8	407	9	2028
Mean		7	942	8	2883
CV%		25	48	21	48
LSD (0.05)		3	1335	3	2322

[1]Rating: 1 = no weed suppression; 10 = total weed suppression.
Planted: 11/2/19 Soil: Marietta fine sandy loam

Table 3. Weed suppression and dry matter yields for cover crop species at two termination dates in Starkville, Mississippi.

Species	March 15 termination		April 1 termination	
	Weed suppression	Dry matter yield	Weed suppression	Dry matter yield
	Rating[1]	*lb/A*	*Rating*	*lb/A*
Balansa	7	350	10	2445
Berseem	7	369	9	2346
Crimson	7	440	8	2360
Hairy Vetch	4	191	6	1917
Radish	7	1147	8	2337
Red clover	6	444	9	2106
Rye	9	2354	10	4856
Ryegrass	9	1027	10	3457
Turnip	8	1005	7	2245
Winter Pea	1	—	7	1964
Mean	6	814	8	2603
CV%	25	49	20	52
LSD (0.05)	2	870	2	1746

[1]Rating: 1 = no weed suppression; 10 = total weed suppression.
Planted: 11/2/19 Soil: Marietta fine sandy loam

Table 4. Estimated nitrogen availability of cover crop varieties at 2 weeks, 3 weeks, and 3 months after two termination dates in Starkville, Mississippi.

Variety	Species	March 15 termination				April 1 termination			
		2 wk.	4 wk.	3 mo.	Total N	2 wk.	4 wk.	3 mo.	Total N
		lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Bates RS4	Rye	5	10	17	32	0	0	1	1
NF97325	Rye	6	12	20	38	0	0	3	4
NF95319B	Rye	5	10	16	31	2	3	6	11
NF99362	Rye	6	11	19	36	1	2	6	9
Elbon	Rye	4	7	11	22	2	4	8	15
Dixie II	Crimson	4	6	9	19	27	40	52	120
Vivant Hybrid Turnip	Turnip	10	16	23	48	13	19	25	56
Centurion	Ryegrass	9	14	21	44	12	21	32	65
Aerifi	Radish	7	12	18	37	11	18	24	53
Jackpot	Turnip	7	11	16	33	16	25	33	74
AU Sunrise	Crimson	5	9	12	27	20	30	39	88
WinterGrazer70	Rye	11	18	27	55	0	1	5	7
Blaza	Crimson	1	2	3	7	22	33	43	99
Super 10	Berseem	5	8	11	24	25	38	49	112
Au Red Ace	Red Clover	5	7	10	22	24	36	46	106
AU Merit	Hairy Vetch	2	3	4	8	17	25	32	74
WinterKing	Hairy Vetch	4	6	9	19	20	31	39	90
Patagonia Inta	Hairy Vetch	—	—	—	—	23	34	44	100
SEBCB19	Berseem	3	6	8	17	23	35	45	103
Balady	Berseem	2	3	4	9	23	34	44	100
Low Boy	Ryegrass	—	—	—	—	5	8	10	24
Gulf	Ryegrass	—	—	—	—	17	29	42	89
CCS 779	Radish	5	9	14	29	12	20	27	59
SECCB18	Crimson	4	7	10	22	20	29	37	86
SECCM18	Crimson	2	3	4	9	22	33	43	99
SERWF19	Radish	—	—	—	—	5	9	13	28
Dixie	Crimson	5	9	12	27	21	32	41	95
Survivor	Winter Pea	—	—	—	—	17	26	33	77
Driller	Radish	6	9	14	29	10	16	22	49
Fixation	Balansa	5	8	11	23	32	48	61	142
Frosty	Berseem	5	8	11	24	23	34	44	101
Mean		5	9	13	27	15	23	31	69
CV%		40	45	45	35	30	35	32	35
LSD (0.05)		8	13	19	30	16	24	31	60

Planted: 11/2/19 Soil: Marietta fine sandy loam

Table 5. Estimated nitrogen availability of cover crop species at two termination dates in Starkville, Mississippi.

Variety	March 15 termination				April 1 termination			
	2 wk.	4 wk.	3 mo.	Total N	2 wk.	4 wk.	3 mo.	Total N
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Balansa	5	8	11	23	32	48	61	142
Berseem	4	6	9	20	23	35	45	104
Crimson	4	6	9	19	22	33	43	98
Hairy Vetch	3	5	7	15	20	30	38	88
Radish	6	10	15	32	10	15	21	46
Red clover	5	7	10	22	24	36	46	106
Rye	6	11	18	36	1	2	5	8
Ryegrass	9	14	21	44	11	20	28	59
Turnip	8	13	19	41	14	22	29	65
Winter Pea	—	—	—	—	17	26	33	77
Mean	6	9	13	28	18	27	35	79
CV%	35	40	35	32	36	30	35	31
LSD (0.05)	5	6	9	11	7	10	16	35

Planted: 11/2/19 Soil: Marietta fine sandy loam

Table 6. Economic value of cover crop nitrogen at Starkville, Mississippi.

Variety	Species	March 15 termination			April 1 termination		
		Total N	Cost[1]	Market value[2]	Total N	Cost	Market value
		lb/A	*$/A*	*$/lb N*	*lb/A*	*$/A*	*$/lb N*
Bates RS4	Rye	31.7	25.0	13.6	0.9	25.0	0.4
NF97325	Rye	38.5	25.0	16.5	3.8	25.0	1.6
NF95319B	Rye	31.2	25.0	13.4	10.7	25.0	4.6
NF99362	Rye	36.0	25.0	15.5	9.1	25.0	3.9
Elbon	Rye	22.3	25.0	9.6	14.6	25.0	6.3
Dixie II	Crimson	19.5	21.0	8.4	119.6	21.0	51.4
Vivant Hybrid Turnip	Turnip	48.2	32.2	20.7	56.0	19.2	24.1
Centurion	Ryegrass	43.9	23.4	18.9	64.9	23.4	27.9
Aerifi	Radish	37.1	21.3	15.9	53.2	21.3	22.9
Jackpot	Turnip	33.2	32.2	14.3	73.9	19.2	31.8
AU Sunrise	Crimson	26.7	21.0	11.5	88.4	21.0	38.0
WinterGrazer70	Rye	55.5	25.0	23.9	7.0	25.0	3.0
Blaza	Crimson	6.9	21.0	3.0	98.8	21.0	42.5
Super 10	Berseem	24.0	38.3	10.3	112.4	38.3	48.3
Au Red Ace	Red Clover	22.3	19.5	9.6	105.7	19.5	45.5
AU Merit	Hairy Vetch	8.2	33.0	3.5	73.6	33.0	31.6
WinterKing	Hairy Vetch	19.3	33.0	8.3	90.1	33.0	38.8
Patagonia Inta	Hairy Vetch	—	33.0	—	100.3	33.0	43.1
SEBCB19	Berseem	17.0	38.3	7.3	102.7	38.3	44.2
Balady	Berseem	9.2	38.3	4.0	100.4	38.3	43.2
Low Boy	Ryegrass	—	23.4	—	23.7	23.4	10.2
Gulf	Ryegrass	—	23.4	—	88.7	23.4	38.1
CCS 779	Radish	28.6	21.3	12.3	59.0	21.3	25.4
SECCB18	Crimson	21.9	21.0	9.4	86.2	21.0	37.1
SECCM18	Crimson	9.2	21.0	4.0	98.6	21.0	42.4
SERWF19	Radish	—	21.3	—	27.5	21.3	11.8
Dixie	Crimson	26.7	21.0	11.5	95.0	21.0	40.8
Survivor	Winter Pea	—	35.0	—	76.7	35.0	33.0
Driller	Radish	28.9	21.3	12.4	48.5	21.3	20.9
Fixation	Balansa	23.2	10.9	10.0	141.6	10.9	60.9
Frosty	Berseem	23.8	38.3	10.2	100.6	38.3	43.3

[1]Cost: average seed prices plus $13 per acre for planting cost.
[2]Market value: assumes fertilizer cost at $0.43 per pound of N.

Table 7. Seed sources for the 2019–20 cover crop variety testing program.	
Variety	**Seed company/source**
Bates RS4	The Noble Foundation
NF97325	The Noble Foundation
NF95319B	The Noble Foundation
NF99362	The Noble Foundation
Elbon	The Noble Foundation
Dixie II	Lewis Seed Co
Vivant Hybrid Turnip	Mountain View Seeds
Centurion	Mountain View Seeds
Aerifi	Mountain View Seeds
Jackpot	Mountain View Seeds
AU Sunrise	Pennington
WinterGrazer70	Pennington
Blaza	Baranburg
Super 10	Baranburg
Au Red Ace	Ragan and Massey
AU Merit	Smith Seed Services
WinterKing	Smith Seed Services
Patagonia Inta	Smith Seed Services
SEBCB19	Smith Seed Services
Balady	Smith Seed Services
Low Boy	Smith Seed Services
Gulf	Smith Seed Services
CCS 779	Smith Seed Services
SECCB18	Smith Seed Services
SECCM18	Smith Seed Services
SERWF19	Smith Seed Services
Dixie	Smith Seed Services
Survivor	Grassland Oregon
Driller	Grassland Oregon
Fixation	Grassland Oregon
Frosty	Grassland Oregon

Reference

Falconer, L., J. M. Riley, and B. Williams. 2016. *Custom Rates for Farm and Ranch Services in Mississippi*. MSU Extension Service. Publication 2776.

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Reuben Moore, Interim Director **www.mafes.msstate.edu**