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Effect of Seeding and Tillage Method on Yield of Jackson Ryegrass

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Introduction

Winter pasture is important to many livestock producers in the South. In the Southeast, October through May is the period most suitable for animal weight gain. During this time, temperatures are normally cool, interspersed with short cold spells. This type of weather is not only conducive to the production of high-quality, cool-season forage that can be utilized by adult cows and weaned calves, but it is also mild enough to avoid weather-related stress in animals. Consequently, most late-winter and early-spring calves are weaned in the fall so they can be grazed over the winter and sold as feeder cattle the following spring.

Many cool-season grasses, small grains, clovers, and combinations of these forages have been planted for animal grazing. For economy and quality, ryegrass has become the pasture of choice for many producers (Tyner 1983, Hovermale 1992, Burris 1979). Many planting methods have been used to plant annual pastures. Each planting method has different costs, yield potential, and time requirements (Lang 1997). Time requirements depend on such things as amount of tillage and method of seeding. Any system that reduces either labor or capital, while maintaining production, increases net profit to the producer.

Different planting methods result in different yields and yield distributions. Generally, tilled treatments are ready to graze in the fall, whereas reduced-tillage systems are not (Lang and Elmore 1995, Lang et al. 1992). However, there is no difference in spring yield, regardless of tillage method.

Materials and Methods

Annual ryegrass (*Lolium multiflorum* Lam. Var. 'Jackson') was planted at 35 pounds per acre into an established bahiagrass sod during early October each year from 1990 to 1996, except 1992. This experiment was planted on the same plot area each year on a Malbis soil (Fine-loamy siliceous, thermic Plinthic Paleudults). The project used a split plot arranged in a randomized complete block design with four replications.

The main plot was used to examine seeding method (conventional grain drill compared to broadcast). Although it is not a no-till planter, the grain drill will penetrate undisturbed soil to a depth of 0.25 to 0.5 inch depending on soil moisture. In the broadcast treatment, seeds were distributed on the soil surface. At ryegrass planting, the bahiagrass was not more than 3 inches tall.

The subplot was used to evaluate five tillage treatments: (1) prepared seedbed 2 weeks before early October planting; (2) light discing 2 weeks before early October planting; (3) no preparation before early October planting; (4) burn down with 1 quart of Gramoxone (1,1'-dimethyl-4-4'-bipyridinium dichloride) 2 weeks before early October planting; and (5) burn down with Gramoxone 2 weeks before Nov. 1 planting. In the first treatment, the seedbed was prepared using a tractor-mounted rototiller. In the second treatment, light discing was performed with a three-point, hitch-mounted disc set to leave 70% to 90% soil coverage. Before planting each year, 68-72-72 pounds per acre of N-P-K were applied. Around Feb. 1, additional nitrogen was applied at a rate of 68 pounds per acre.

Ryegrass was harvested with a rotary mower when it reached 10 to 12 inches in height. Samples were dried in a forced-air oven, and yield was converted to pounds of dry matter per acre. Rainfall, evaporation, and maximum/minimum temperature data were collected by the National Weather Service station at the South Mississippi Branch Experiment Station. Data were analyzed using the Anova procedure of the SAS system (SAS Institute, Carey, NC).

RESULTS

Seeding method did not significantly affect ryegrass yield in any given year or in the 5-year average. Therefore, data concerning seeding method are not presented in this publication. Data for tillage were pooled across seeding method.

Treatment 1 (prepared seedbed) yielded the most ryegrass dry matter for the first four harvests and for the entire growing season in 1990-91. Ryegrass planted in the prepared seedbed had a seasonal yield of 4,148 pounds of dry matter per acre (Table 1). Treatment 5 (burn down before November planting) resulted in the next-to-lowest yield — 2,840 pounds per acre. Treatment 3 (no pretreatment) resulted in the lowest yield of 1990-91.

In 1991-92, ryegrass planted in the prepared seedbed yielded the most dry matter for the first two harvests and for the entire growing season. Season-long yield in the prepared seedbed was 4,261 pounds of dry matter per acre (Table 2). For the first harvest, the prepared seedbed yielded 1,256 pounds per acre. Treatment 2 (light discing) resulted in the second-highest yield — 865 pounds per acre — in the first harvest. For the second harvest, ryegrass planted in the prepared seedbed yielded 988

Table 1. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 1990-91.[1]

Tillage method	Harvest date						Total
	2/1	2/27	3/18	4/5	4/22	5/1	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	468	766	457	1,103	1,005	348	4,148
Disc lightly	164	476	362	922	987	495	3,407
No preplant treatment	95	338	283	800	958	638	3,111
Burn down and plant in October	164	509	373	873	1,012	433	3,364
Burn down and plant on Nov.1	53	203	196	720	972	696	2,840
Mean	188	458	334	883	986	522	3,374
LSD (0.05)	140	175	73	149	NS	140	453
CV %	72	37	21	16	12	19	13

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

Table 2. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 1991-92.[1]

Tillage method	Harvest date				Total
	2/27	3/12	4/3	5/14	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	1,256	988	1,106	911	4,261
Disc lightly	865	769	924	1,072	3,630
No preplant treatment	623	669	845	967	3,105
Burn down and plant in October	656	698	967	1,133	3,455
Burn down and plant on Nov.1	570	716	876	998	3,160
Mean	794	768	944	1,016	3,522
LSD (0.05)	179	153	NS	NS	555
CV %	22	19	20	22	15

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

pounds per acre. Tillage method did not affect yield in the third and fourth harvests of 1991-92.

The prepared seedbed treatment still resulted in the highest season-long yield and the highest first-harvest yield in 1993-94, but yields in other harvests were more variable (Table 3). The prepared seedbed yielded 5,324 pounds of dry matter per acre for the growing season and 1,611 pounds per acre for the first harvest. Treatment 4 (burn down before October planting) resulted in the lowest first harvest — 96 pounds per acre. For the second harvest, the prepared seedbed treatment (946 pounds per acre) and the lightly disced treatment were not significantly different, but they were higher yielding that the other three treatments. Treatment 4 again resulted in the lowest yield for the second harvest — 196 pounds per acre. For the third harvest, ryegrass planted in the prepared seedbed yielded 452 pounds, which was more than treatment 3 (no pretreatment) but not significantly different from the other three treatments. Results of the fourth harvest date followed the same trend as the third, and there was no difference among treatments for the fifth harvest.

For the 1994-95 growing season, total yield of ryegrass planted in the prepared seedbed was 3,459 pounds of dry matter per acre, which was higher than all other treatments (Table 4). Treatment 2 (light discing) had the second-highest season-long yield, followed by treatment 5 (burn down before November planting). For the first harvest, the prepared seedbed, treatment 2, and treatment 5 all had similar yields, which were greater than the other

Table 3. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 1993-1994.[1]

Tillage method	Harvest date					Total
	1/21	2/16	3/3	3/24	4/19	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	1,611	946	452	840	1,474	5,324
Disc lightly	1,011	778	370	591	1,420	4,170
No preplant treatment	673	501	231	451	1,358	3,215
Burn down and plant in October	96	196	141	237	1,296	1,967
Burn down and plant on Nov.1	1,011	660	314	533	1,428	3,945
Mean	880	616	302	531	1,395	3,724
LSD (0.05)	359	268	169	312	NS	1,139
CV%	39	42	54	57	22	30

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

Table 4. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 1994-95.[1]

Tillage method	Harvest date					Total
	12/18	2/9	3/10	4/3	4/25	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	353	1,133	919	557	497	3,459
Disc lightly	416	943	467	454	457	2,737
No preplant treatment	0	40	45	173	369	628
Burn down and plant in October	10	142	67	207	418	844
Burn down and plant on Nov.1	311	429	135	280	412	1,566
Mean	218	537	326	334	431	1,847
LSD (0.05)	151	283	297	129	103	622
CV %	37	51	88	37	23	32

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

two treatments. For the third and fourth harvests, ryegrass planted in the prepared and lightly disced seedbeds yielded more than all other treatments. Tillage treatment did not affect yield in the fifth harvest.

For the 1995-96 growing season, the highest yields came from the prepared seedbed (5,267 pounds of dry matter per acre), lightly disced seedbed (4,765 pounds per acre), and November-planted no-till (4,483 pounds per acre) (Table 5). For the first harvest, ryegrass planted in a prepared seedbed yielded 1,052 pounds per acre, while the lightly disced seedbed yielded 752 pounds per acre. November-planted ryegrass had a statistically similar yield in the first harvest, but the October-planted treatments resulted in smaller yields. Yields followed the same trend for the second harvest. Prepared seedbed, lightly disced, and November-planted treatments again outyielded the other two treatments in the third harvest. Lightly disced and November-planted treatments outyielded the other treatments for the fourth harvest. Ryegrass planted in the prepared seedbed had the highest yields for the fifth harvest.

Over the 5 years of the experiment, annual ryegrass yield was 4,492 pounds of dry matter per acre for the prepared seedbed treatment (Table 6). The second-highest 5-year yield (3,742 pounds per acre) came from the lightly disced seedbed. November-planted ryegrass had the next-highest yield — 3,200 pounds per acre. Use of a burn-down herbicide provided no yield advantage in the early-October planting.

Table 5. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 1995-96.[1]

Tillage method	Harvest date					Total
	1/17	2/26	3/18	4/11	5/9	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	1,052	1,307	1,011	741	1,156	5,267
Disc lightly	752	1,693	1,063	806	975	4,765
No preplant treatment	0	129	655	539	960	2,283
Burn down and plant in October	0	121	615	663	809	2,209
Burn down and plant on Nov.1	658	894	1,310	775	744	4,483
Mean	492	724	931	705	949	3,801
LSD (0.05)	354	388	257	142	212	802
CV%	70	52	27	19	22	20

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

Table 6. Effect of tillage method on dry matter yield of Jackson ryegrass, MAFES South Mississippi Branch, 5-year average.[1]

Tillage method	Harvest date					Average
	90-91	91-92	93-94	94-95	95-96	
	lb/A	*lb/A*	*lb/A*	*lb/A*	*lb/A*	*lb/A*
Prepared seedbed	4,147	4,261	5,324	3,459	5,268	4,492
Disc lightly	3,407	3,630	4,170	2,737	4,765	3,742
No preplant treatment	3,111	3,105	3,215	628	2,284	2,468
Burn down and plant in October	3,364	3,455	1,967	844	2,209	2,368
Burn down and plant on Nov.1	2,840	3,160	3,945	1,566	4,487	3,200
Mean	3,374	3,522	3,724	1,847	3,802	3,253
LSD (0.05)	1,273	555	1,139	622	802	310
CV%	6	15	30	32	20	22

[1]Different seeding methods were tested, but neither had a significant impact on yield. Therefore, data on the effect of tillage method were averaged over seeding method.

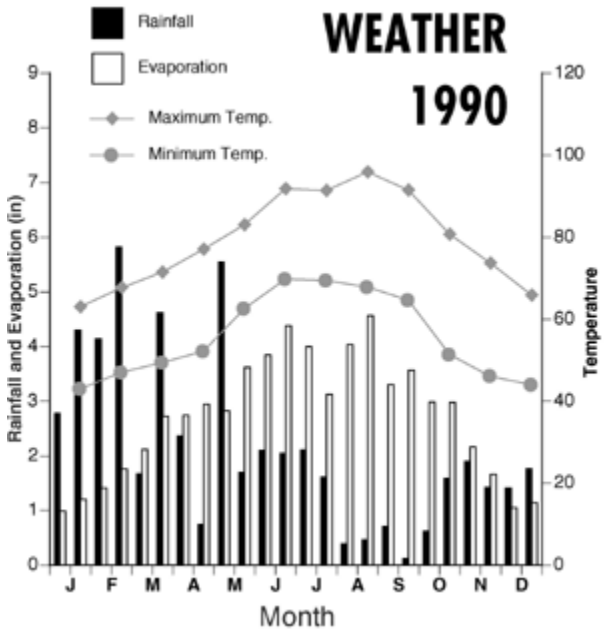
Discussion

These data indicate that regardless of the seeding method used, planting ryegrass in a prepared seedbed produced the earliest grazing and highest total dry matter yield. Discing lightly to expose some mineral soil before planting produced the second-highest annual yield. Averaged over 5 years, the discing treatment yielded 83% as much as the prepared seedbed treatment. November-planted ryegrass yielded 71% as much as the prepared seedbed treatment. The other treatments resulted in yields approximately half the size of those in the prepared seedbed treatment. These percentages were consistent over years.

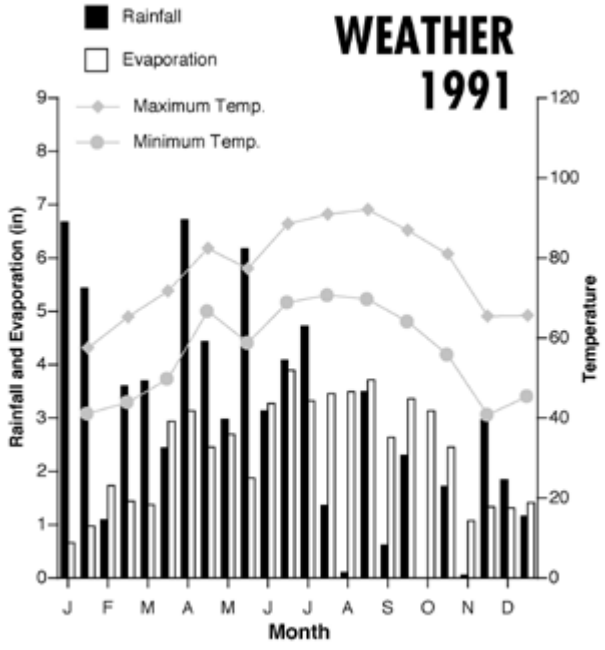
Two factors could explain the relatively high yield of the November planting. Later in the season, the bahiagrass may be easier to burn down with Gramoxone. Also, cooler temperatures are beneficial when the ryegrass is emerging.

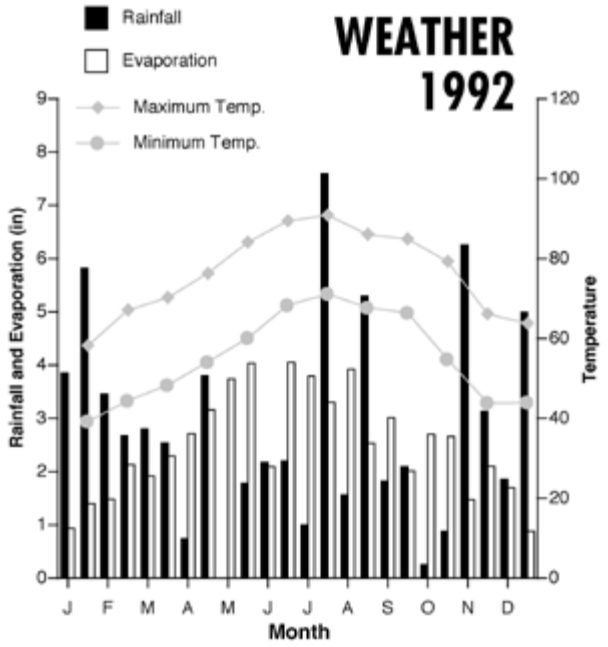
Rainfall during the September-November period (Figures 1-7) and the continued growth of bahiagrass appear to be related to the poor performance of treatment 3 (no preplant preparation) and treatment 4 (burn down before October planting). Before the 1990, 1994, and 1995 planting seasons it was extremely dry. Rainfall seemed adequate at the time of planting, but this moisture evaporated in the extreme heat. Open pan evaporation tests performed at 2-week intervals showed that evaporation equaled or exceeded the accumulated rainfall. Heavy rain occurred in the first 2 weeks of the 1994 season, but the intensity of the rainfall probably resulted in high runoff and little percolation.

Data from this study suggest that a prepared seedbed results in the highest dry matter yield. Treatments with light discing or a Gramoxone burn down before Nov. 1 planting were next most effective. Using Gramoxone to burn down bahiagrass did not increase ryegrass yields, as compared with the completely unprepared treatment, when planting occurred in October. These data indicate that planting ryegrass into bahiagrass without tillage should not be done in southern Mississippi until early November.

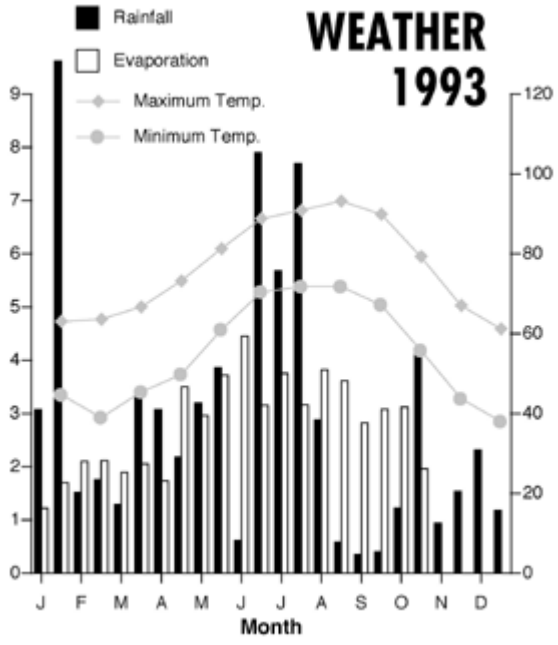


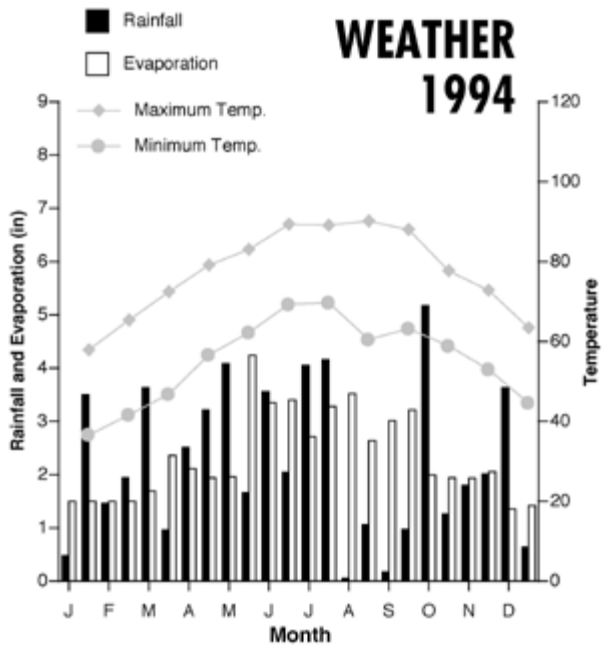
Figures 1-2. Rainfall, evaporation, and maximum and minimum temperatures averaged for 2-week intervals.



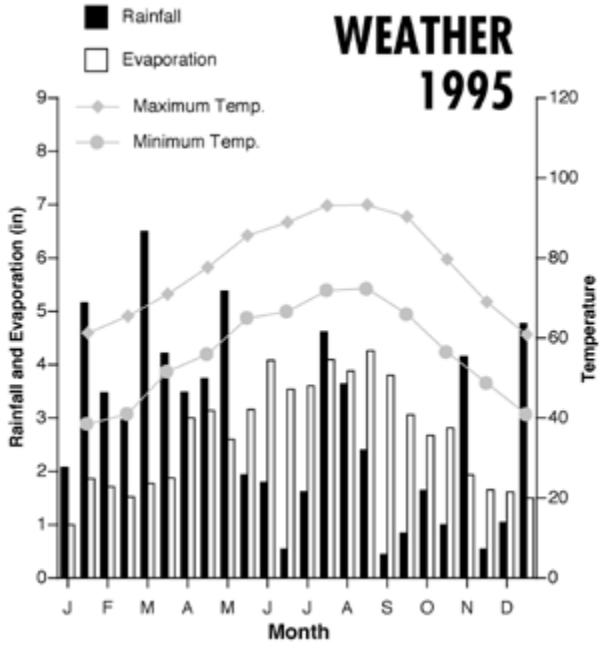


Figures 3-4. Rainfall, evaporation, and maximum and minimum temperatures averaged for 2-week intervals.





Figures 5-6. Rainfall, evaporation, and maximum and minimum temperatures averaged for 2-week intervals.



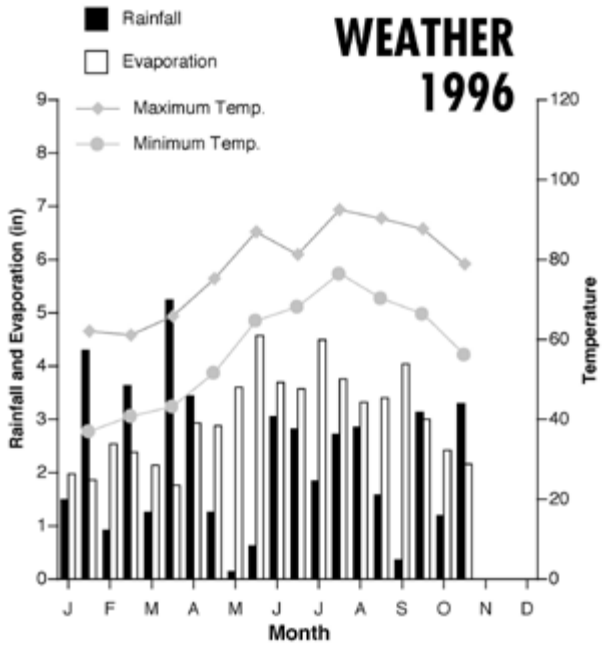


Figure 7. Rainfall, evaporation, and maximum and minimum temperatures averaged for 2-week intervals.

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