TILLAGE PRACTICES FOR OVER-SEEDING BERMUDAGRASS WITH RYEGRASS

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INTRODUCTION

Ryegrass *Lolium multiflorum* Lam.) is typically grown on a conventionally prepared seedbed in Mississippi. The conventional method of seedbed preparation for seeding winter annual grazing crops is by disking several times and harrowing to form a smooth seedbed. After planting, the soil is cultipacked. Complete seedbed preparation often creates animal bogging during wet conditions and can contribute to excessive erosion. Recent USDA farm bills have restricted plowing as a system of planting forage crops. Winter annual forage production in a prepared seedbed generally provides earlier grazing and tends to yield more (Coats, 1957, Lang et.al., 1992, and Lang and Elmore 1995). Also, low sod height when planted no-till enhances earliness and improves seedling density (Evers, 1993). However, lower summer yields of perennial grasses after a fall ryegrass planting were obtained from severely disturbed seedbeds (Dudley and Wise, 1953). The objective of this study was to compare the effects of tillage on fall and winter growth of ryegrass and summer growth of bermudagrass.

MATERIALS AND METHODS

An experiment was conducted at the Leveck Animal Research Center, Mississippi State University, to evaluate the influence of different herbicide and tillage treatments on stand establishment and *dry* matter production of ryegrass over-seeded into a perennial grass sod. A Tye™ no-till grain dnll was used to over-seed 'Marshall' ryegrass into a 'Grazer' bermudagrass *(Cynodon dactylon* (L.) Pers.) sod. The study was conducted for 2 years, 1997-98 and 1998-99. The soil type was a Marietta fine sandy loam (fine-loamy, siliceous, thermic Fluvaquentic Eutrochrepts), a moderately well drained alluvial flood plain soil.

Plot design for the experiment was randomized complete block (RCB) with one herbicide and three tillage treatments. Treatments were replicated four times. Paraquat at 0.25 lb ai/A plus surfactant was used as a preplant burndown on the sod (no-till) plot. Vegetation removal was done with a mower and bagger set at 0.5 in. height 14 days following application. Hay was removed at 2.5 in. 1 week prior to tillage Tillage plots consisted of three levels of sod destruction: Disked 1X, Disked 2X, and roto-tilled for complete sod destruction. Analysis of Variance (ANOVA) was calculated using SAS with mean separation by LSD (SAS, 1985).

Year one: Paraquat as Gramoxone was applied at 0.25 lb ai/A on Aug. 11, 1997 on the sod plot. Remainder of plots were harvested for hay on Aug. 28, 1997. Tillage was done on sod destruction plots and herbicide plot was burned with fire on Sept. 3, 1997. Marshall ryegrass was planted Sept. 11, 1997 with 40 lb/A. Three cool season harvests and three summer harvests were made the first year. Fertilizer was applied in split applications at 268-163-206 (N-P_2O_5-K_20) lb/A. Grazon P+D at 2 pt/A was applied on Apr. 8, 1998 for broadleaf weed control.

Year two: Paraquat was applied at 0.25 lb ai/A on Aug. 20, 1998. Tillage treatments were completed on Sept. 2, 1998. Forty Ib/A of Marshall ryegrass was planted on Sept. 14, 1998. The experiment was irrigated three times: Oct. 14, 1998 (0.7 in.), Oct. 16, 1998 (0.7 in.), and Nov. 5, 1998 (1.25 in.). Stand estimations of ryegrass were made on Dec. 2, 1998, Apr. 5, 1999, Apr. 27, 1999, and May 19,1999 at each harvest date. Stand estimations for warm season grasses were made Sept. 14, 1998. Fertilizer was applied in split applications at 262-97-155 (N-P_2O_5-K_2O) lb/A. Ally was applied at 0.3 oz/A on June 21,1999 for bahiagrass control.

RESULTS AND DISCUSSION

Ryegrass germinated slowly the first year of study due to a dry Oct. and Nov. (Table 1). Complete sod destruction of roto-till and disk 2X had near perfect stands by Jan. 1998 the first year and by Dec. 1998 for the second year. However, ryegrass ground cover in roto-tilled plots were rated significantly greater than either of the reduced tillage treatments (Tables 2 and 3). Ryegrass stand and ground cover were generally the same for all tillage treatments ($P<0.05$) after April of both years except ground cover on Apr. 6, 1998 was lower ($P<0.05$) and stand on Apr. 5,1999 was lower $P<0.05$) in the no till plots. Neither stand nor ground cover were affected by different levels of sod destruction with tillage either year when observed in April.

The dry fall of 1997 reduced earliness of cool season forage production. The first harvest was March 2,1998. The three irrigations during Fall 1998 helped to increase earliness of forage production, with the first harvest being on Dec. 2, 1998 and 4 months earlier than the previous year. Roto-tilled sod treatments yielded higher at each harvest each year of study (Tables 4 and 5). In general, ryegrass production was increased in proportion to the degree of sod destruction both years.

Bermudagrass stand and composition were reduced ($P<0.05$) more by roto-tilling than the lesser levels of sod destruction of disking 1X, 2X, or no tillage both years (Tables 6 and 7). Bermudagrass stands on roto-tilled plots were less than 50% compared with either of the less disturbed sod plots.

Bermudagrass dry matter yield was lower for roto-tilled sod plots both years of study (Tables 8 and 9). Increased sod destruction encouraged other grasses to compete. Crabgrass [(*Digitaria sanguinalis* (L.) Scop.], Broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash], and yellow foxtail [*Setaria glauca* (L.) Beauv.] increased with an increase in sod destruction. Roto-tilled plots had more total grass (ryegrass, annual grass, and bermudagrass) production over the entire year than either disked 2X, 1X, or no tillage both years of study. Forage from ryegrass and annual grasses was increased , while the perennial grass yield was decreased. The total production was increased.

SUMMARY

Ryegrass was over-seeded into a bermudagrass sod with a 'Tye' no-till drill. The tillage treatments were roto-tilled, disked 2X, disked 1X, and no tillage for four levels of sod destruction with roto-tilled being complete destruction and no tillage being none. Herbicide was applied on the sod-seeded plots prior to herbage removal. Ryegrass stand and ground cover were higher under the complete sod destruction by roto-tilling and disking 2X than they were with the lesser levels of sod destruction of disking 1X and no tillage. Yearly ryegrass dry matter yields for total sod destruction were more than twice as great compared with no sod destruction. Roto-tilled ryegrass yield was 40% greater than either disking 1X or 2X. Ryegrass yield increased with

increased sod destruction as compared with no tillage. Less tillage or sod destruction resulted in delayed ryegrass stand and ground cover into the winter growing season, which caused reduced dry matter yield; however, this reduction in ryegrass yield allowed for earlier summer growth of perennial and annual grasses. Complete sod destruction increased total *dry* matter yield for cool season and summer grasses when compared with no tillage. However, the composition of yield changed. Summer perennial grasses decreased in stand, ground cover, and yield, whereas, summer annual grass composition increased with a corresponding increase in sod destruction by tillage. Similar results were observed both years of this study. In general, cool season production of ryegrass was increased by the degree to which the sod had been disturbed that fall. Bermudagrass production was decreased by the degree of sod destruction the previous fall.

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Table 1. Rainfall at Plant Science Research Center, Mississippi State Universitv. 1997-1999.

	1997	1998	1999
January	7.2	6.5	8.1
February	5.2	7.4	2.6
March	4.5	4.3	4.4
April	5.1	3.6	4.5
May	7.7	2.5	3.0
June	5.0	2.0	3.6
July	3.3	5.2	4.0
August	3.5	5.3	0.9
September	3.4	0.5	3.7
October	4.9	0.9	1.4
November	3.2	2.2	2.2
December	2.5	6.5	2.9
Total	55.6 in.	44.4 in.	41.3 in.

Table 2. Ryegrass stand and cover as affected by level of sod destruction, 1997-1998.

Sod destruction	Januarv 20.1998		March2. 1998		April 6, 1998		April 23, 1998	
	Stand	Cover	Stand	Cover	Stand	Cover	Stand	Cover
	(%)							
Roto-till	100a	85 a	100	90 a	100	88 a	100	100
Disk 2X	95 ab	19b	91	34 b	94	71 a	95	96
Disk 1X	79 b	14bc	82	19c	89	68 a	93	94
No till	81b	11c	66	16c	71	44b	74	75
Mean	85	23	75	28	79	56	82	83
CV %	14	20	32	19	33	19	34	3
LSD 0.05	10	6	NS	11	NS	21	NS	NS

NS = not significantly different.
Means followed by different letters within each column were significantly different.

Table 3. Ryegrass stand and cover as affected by level of sod destruction, 1998-1999.

Sod destruction	December 2, 1998		March 10, 1999		April 5, 1999		April 28,1999	
	Stand	Cover	Stand	Cover	Stand	Cover	Stand	Cover
	(%)							
Roto-till	99 a	86 a	99 a	100a	100a	97	100a	100
Disk 2X	86 ab	29 b	90 ab	64b	94 ab	96	94 a	88
Disk 1X	73 b	21 c	70 bc	54b	86 ab	88	87 a	87
No till	32 c	6 d	47 c	31 c	63 b	66	58 b	66
Mean	52	21	62	46	74	76	71	76
CV %	32	27	32	30	31	31	28	33
LSD 0.05	22	7	26	18	30	NS	27	NS

NS = not significantly different.
Means followed by different letters within each column were significantly different.

Table 4. Ryegrass dry matter yield as affected by level of sod destruction, 1997-1998.

Sod Destruction	March 2,1998	April 6,1998	April 23,1998	May 14,1998	Total
	----------(lb/A)----------				
Roto-till	781 a	685 a	552 a	757 a	2775 a
Disk 2X	101 b	338 b	546 a	566 b	1550 b
Disk 1X	32 b	275 bc	471 a	573 b	1351 bc
No till	34 b	171 c	361 b	491 b	1057 c
Mean	259	409	465	544	1677
CV %	35	21	22	24	21
LSD 0.05	101	106	186	174	448

Means followed by different letters within each column were significantly different.

Table 5. Ryegrass dry matter yield as affected by level of sod destruction, 1998-1999.

Sod Destruction	December 2,1998	March 10,1999	April 5,1999	April 28,1999	Total
	----------(lb/A)----------				
Roto-till	423 a	1193 a	2415 a	1150	4896 a
Disk 2X	153 b	183 b	1504 b	1107	2989 b
Disk 1X	104 b	140 b	1427 b	904	2777 b
No till	45 b	72 b	840 c	865	1860 c
Mean	113	234	1193	955	2495
CV %	92	52	28	35	27
LSD 0.05	137	161	436	NS	889

Means followed by different letters within each column were significantly different.
NS = Not significantly different.

Table 6. Bermudagrass stand and composition as affected by level of sad destruction, 1997-1998.

Sod Destruction	Bermudagrass Stand		Bermudagrass Composition		
	June 10,1998	July 20, 1998	June 10,1998	July 21,1998	August 30,1998
	(%)				
Roto-till	58 b	65	35 b	16 b	13 b
Disk 2X	98 a	85	70 a	35 a	48 a
Disk 1X	100 a	80	66 a	24 ab	31 ab
No till	94 a	82	69 a	31 a	37 ab
Mean	91	80	65	34	44
CV %	19	22	17	55	28
LSD 0.05	23	NS	15	14	25

Means followed by different letters within each column were significantly different.
NS = Not significantly different.

Table 7. Bermudagrass stand and composition as affected by level of sod destruction, 1998-1999.

Sod Destruction	June 27,1999		July 21.1999	September 30.1999	
	Stand	Composition	Composition	Stand	Composition
	(%)				
Roto-till	38 b	38 b	2 b	36 b	20 b
Disk 2X	82 a	75 a	35 a	90 a	57 a
Disk 1X	85 a	73 a	33 a	74 a	51 a
No till	78 a	71 a	52 a	85 a	63 a
Mean	74	67	41	78	55
CV %	24	28	50	25	29
LSD 0.05	23	24	27	25	21

Means followed by different letters within each column were significantly different.

Table 8. Dry matter yield of bermudagrass (BG) as affected by level of sod destruction, 1997-1998.

Sod destruction	June 10 1998		July 21, 1998		August 30, 1998		Total	
	BG	Annual grass	BG	Annual grass	BG	Annual grass	BG	Annual grass
	(lb/A)							
Roto-till	129 b	248	355	2389a	1956b	0	2441 b	2637a
Disk 2X	543 a	235	997	1185 b	2356a	0	3896a	1421 b
Disk 1X	516 a	244	595	1492b	2396a	0	3507a	1736ab
No till	623 a	263	766	1348b	1246c	0	2635 b	1611 b
Mean	538	256	722	1476	1617	0	2877	1731
CV %	37	40	66	45	11		21	41
LSD 0.05	261	NS	NS	864	237		783	926

Means followed by different letters within each column were significantly different.
NS = Not significantly different.

Table 9. Dry matter yield of bermudagrass as affected by level of sod destruction, 1998-1999.

Sod destruction	June 27.1999		July 21, 1999		September 30.1999		Total	
	BG	Annual grass	BG	Annual grass	BG	Annual grass	BG	Annual grass
			(lb/A)					
Roto-till	134 b	286	106 b	6132a	268b	1144a	508b	7562a
Disk 2X	579 a	189	1363a	2585b	937a	671 b	2879a	3445b
Disk 1X	520 a	203	1211a	2697b	916a	826 ab	2647a	3727b
No till	588 a	189	1571a	1726b	773a	566b	2932a	2563b
Mean	522	254	1317	2506	748	684	2586	3444
CV %	47	58	48	43	34	49	35	41
LSD 0.05	325	NS	830	1428	330	443	1171	1869

Means followed by different letters within each column were significantly different.
NS = Not significantly different.