Comparison of Planting Equipment for Sod-Seeded Ryegrass

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ABSTRACT

Fall planted winter annuals yield less when overseeded, compared with the growth achieved with plowing and disking. The objective of this study was to compare planting equipment which provided various levels of residue and soil disturbance. Ryegrass was planted in a bermudagrass pasture with: 1. Tye no-till drill, 2. Tarver no-till drill, 3. Broadcast following Hay-King subsoiler, or 4. Broadcast. Establishment of ryegrass with the Tarver resulted in an initial stand (30 days after planting, DAP) of 74%, compared with 25% for ryegrass established with the Tye, and only 10% for ryegrass broadcast seeded. At 60 DAP, ryegrass stands were 86% when planted with the Tarver, 70% with the Tye, and 53% when broadcast. Ryegrass plant height and ground cover were also greater with the Tarver, compared with the Tye or Broadcast. There were no differences between N fertilizer sources. There was a 2.3 fold difference between the early fall yield of ryegrass seeded with the Tarver, compared with the early fall ryegrass yield planted with the Tye.

KEYWORDS

Ryegrass establishment, planting method, sod-seeding.

INTRODUCTION

Annual Ryegrass (*Lolium multiflorum*) is overseeded in the fall into warm season grass pastures on thousands of acres throughout the southeastern U.S.A. by various techniques. A common method is to broadcast seed (usually mixed with fertilizer) directly on top of the pasture with or without light discing and cultipacking. Some producers use a grain drill or a drill designed for no-till seeding of winter annuals. However, without tillage, early yield of ryegrass is greatly reduced compared with ryegrass seeded into a prepared seedbed (Coats, 1957; Dudley and Wise, 1953; Lang, 1989; Lang *et al*., 1992; Lang and Elmore, 1995; Lang *et al*., 1997; Cuomo *et al*., 1999; Elmore and Lang, 2000). Previous work has focused on improving fall growth of sod-seeded ryegrass and other winter annuals with little success. It was essential to remove the growth residue of the summer grass (Cuomo *et al*., 1999), but a herbicide burndown has not been necessary if the summer grass is cut for hay late in the fall or cattle graze the summer grass (Lang, 1989; Brock *et al.*, 1992; Ingram *et al*., 1993; Lang and Elmore, 1995; Lang *et al*., 1997; Elmore and Lang, 2000). Sod-seeded ryegrass did not respond proportionally to fertilizer-N up to 150 lbs N acre^{-1}, compared with ryegrass sown into a prepared seedbed (Lang and Elmore, 1995). There is a need for technology, which improves fall growth for sod-seeding winter annuals into summer grass pastures. The objectives of this study were to compare planting equipment and nitrogen source on fall seeded ryegrass sown into a bermudagrass pasture.

MATERIALS AND METHODS

The experiment was located within a heavily grazed 25-acre bermudagrass dominated pasture (Table 1) on an Oktibbeha soil (Very-fine, smectitic, thermic Chromic Dystruderts). Soil test P and K were medium to high; pH was 6.2. 'Marshall' ryegrass was planted without an herbicide burn-down at 35 lbs acre^{-1} on September 27, 2001 with a Tarver drill, Tye drill, broadcast following a Hay King subsoiler, or broadcast. Ryegrass plots planted with the Tarver drill and Tye drill received nitrogen fertilizer at 65 lbs N acre^{-1} as ammonium nitrate (34–0-0), urea (30-10-10), or liquid N-Sol. Plots Broadcast planted received N-Sol as the N-Source. A unique feature of the Tarver Drill was that fertilizer was placed below the seed during planting. Fertilizer as 34-0-0 or 30-10-10 was broadcast following seeding with the Tye drill. N-Sol was applied following planting within all planting methods. Nitrogen treatments were reapplied in December, 2001, February, 2002, and April, 2002. Each treatment plot was 24' wide and 300' long planted along the contour of the field and replicated three times. Three transects along each 300' length were established perpendicular to the replications in order to account for field variation within the large treatment plots.

Ryegrass was evaluated for stand, ground cover, and botanical composition by visual techniques. Plant height was determined with a floating cardboard attached to a meter stick. Yield was calculated by harvesting a known area with a Carter forage harvester following dry matter determination. Data were analyzed with SAS and calculated in order to perform comparisons between 'Drill vs. Broadcast', 'Tarver vs. Tye', 'Liquid N vs. Dry N within Drill', and '34-0-0 vs. 30-10-10 within Drill' treatments.

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Table 1. Characterization of initial botanical composition on October 2, 2001

Equipment / N- Treatment	Bermuda Stand	Dallisgrass Stand	Sward Height	Residue Thickness
	---------- % ----------		--- inch --	†
Tarver 34-0-0	87	7	3.1	3.4
Tarver 30-10-10	83	11	3.2	3.2
Tarver N-Sol	84	8	3.7	3.1
Tye 34-0-0	90	7	3.8	3.2
Tye 30-10-10	80	13	3.8	3.2
Tye N-Sol	85	17	2.8	3.6
Hay King N-Sol	92	5	3.2	3.7
Broadcast N-Sol	84	13	3.3	3.3
LSD (0.05)	12	12	1.0	0.9
Linear contrast				
Drill vs Broadcast	NS	NS	NS	NS
Tarver vs Tye	NS	NS	NS	NS
Liquid N vs Dry w/Drill	NS	NS	NS	NS
34-0-0 vs Urea w/Drill	NS	NS	NS	NS

† Residue thickness scored on a scale of 1 to 10, where 1 = least amount of residue and 10 = most.

RESULTS AND DISCUSSION

The plot area was uniform in terms of botanical composition: short, with a low level of top growth (Table 1). Ryegrass stands established rapidly in plots planted with the Tarver drill, moderate when planted with the Tye drill, and slow when broadcast seeded (Table 2). By early December, ryegrass stand was similar in plots planted with the Tarver or Tye, but stand of broadcast seeded ryegrass was less (Table 3). Ryegrass stand was similar for all planting methods by February (data not shown).

Fall growth of ryegrass was superior when planted with Tarver drill as compared with the Tye drill or broadcast (Table 3). There were no differences between N fertilizer sources. The 2.3 fold difference between the early fall yield of ryegrass seeded with the Tarver, compared with the early fall ryegrass yield planted with the Tye, is in the low range (2x to 10x) of previous work comparing ryegrass growth sown into a prepared seedbed with ryegrass sod-seeded with a Tye Drill (Lang and Elmore, 1995; Elmore and Lang, 2000). The Tye is equipped with a single coulter and double disk openers, which cut 1-2" deep and leaves a narrow slit through the sod. The Tarver drill has a slicing coulter which cuts 2.5" deep followed by a ripping shank that penetrates 3/4" wide and 5.5" deep leaving a mini-prepared seedbed within the sod (Tarver, 1997), which provided 137% more early fall ryegrass growth compared with the Tye planter (Table 3).

Previous work has shown that the fall growth suppression with sod-seedings of ryegrass disappears in the spring (Lang, 1989; Lang and Elmore, 1995; Elmore and Lang, 2000). A similar pattern occurred in the current study (Table 4). Ryegrass yield was generally similar in February and April in plots seeded with the Tarver as compared with those planted with the Tye. Yield of ryegrass. Broadcast seeded was lower than ryegrass planted with either drill, but there was no advantage to using the Hay King subsoiler to establish ryegrass. Stand and yield of bermudagrass will be measured during the summer of 2002 in order to determine any long term effects of the various ryegrass planting methods.

Table 2. Initial Ryegrass stand, height and ground cover (GC) on November 1, 2001.

Equipment / N- Treatment	Ryegrass Stand	Ryegrass Height	Ryegrass GC
	--- % ---	--- inch---	--- % ---
Tarver 34-0-0	71	7.1	10
Tarver 30-10-10	80	7.9	10
Tarver N-Sol	70	7.6	8
Tye 34-0-0	37	4.1	5
Tye 30-10-10	19	4.6	4
Tye N-Sol	16	3.2	3
Hay King N-Sol	13	4.1	2
Broadcast N-Sol	5	2.0	1
LSD (0.05)	28	2	3
Linear contrast			
Drill vs Broadcast	***	***	***
Tarver vs Tye	**	**	**
Liquid N vs Dry w/Drill	NS	NS	NS
34-0-0 vs Urea w/Drill	NS	NS	NS

**, *** $P =$ 0.01 and 0.001, respectively

Table 3. Ryegrass stand and yield on December 4, 2001.

Equipment / N- Treatment	Ryegrass Stand	Ryegrass Yield
	--- % ---	lbs acre^{-1}
Tarver 34-0-0	87	875
Tarver 30-10-10	81	800
Tarver N-Sol	88	1013
Tye 34-0-0	80	571
Tye 30-10-10	72	222
Tye N-Sol	63	357
Hay King N-Sol	55	338
Broadcast N-Sol	33	86
LSD $_{(0.05)}$	26	572
Linear contrast		
Drill vs Broadcast	**	*
Tarver vs Tye	*	*
Liquid N vs Dry w/Drill	NS	NS
34-0-0 vs Urea w/Drill	NS	NS

*, ** $P =$ 0.05 and 0.01, respectively

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Table 4. Yield of sod-seeded ryegrass as influenced by planting equipment and nitrogen source.

Equipment / N- Treatment	12-4-2001	2-22-2002	4-10-2002	Total
	lbs acre^{-1}			
Tarver 34-0-0	875	1052	3139	5066
Tarver 30-10-10	800	1052	3324	5176
Tarver N-Sol	1013	1103	4233	6349
Tye 34-0-0	571	993	3138	4702
Tye 30-10-10	222	927	3628	4777
Tye N-Sol	357	528	2939	3824
Hay King N-Sol	338	594	2112	3044
Broadcast N-Sol	86	306	2121	2513
LSD $_{(0.05)}$	572	385	893	1994
Linear contrast				
Drill vs Broadcast	*	**	**	**
Tarver vs Tye	*	**	NS	**
Liquid N vs Dry w/Drill	NS	NS	NS	NS
34-0-0 vs Urea w/Drill	NS	NS	NS	NS

*, ** $P =$ 0.05 and 0.01, respectively