ESTABLISHMENT OF NON-TOXIC NOVEL ENDOPHYTE TALL FESCUE

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ABSTRACT

Toxic tall fescue (*Festuca arundinacea*) infected with the *Neotyphodium coenophialum* endophyte reduces animal gain, calf crop, milk production, and can be lethal to mares and foals. Destruction of the stand eliminates forage production for six to twelve months. The advent of glyphosate tolerant corn (*Zea mays*) and soybean (*Glycine max)* opens up new possibilities for toxic tall fescue renovation. A pasture containing toxic tall fescue was sprayed with paraquat in March and glyphosate tolerant corn and soybean were no-till planted in April. Glyphosate was applied in May. The corn and soybean were harvested for grain in September. MaxQ tall fescue was planted in October. Half the plots were also over-seeded to wheat. Forage yield of tall fescue and wheat were determined twice each spring for two years. Stand of tall fescue was evaluated after one year. The entire sequence of killing toxic tall fescue, planting corn and soybean, and planting tall fescue and wheat was repeated over two years. Inclusion of wheat increased first year forage yield without substantial effects on tall fescue stand. Forage yield was 162 to 188% greater following soybean compared with following corn.

INTRODUCTION

Summer annual crops have been used successfully to destroy existing tall fescue (Defelice and Henning, 1990; Munson and Bailey, 1991; Bagegni et al, 1994). Corn and soybean can be successfully grown as cash crops in tall fescue pastures (Broome et al, 2000). Glyphosate tolerant corn and soybean has opened the way for new renovation sequences for destroying toxic tall fescue infected with the *Neotyphodium coenophialum* endophyte (Triplett et al, 2002). Corn and soybean offer the potential for a cash crop thereby reducing the cost of destruction and reestablishment of tall fescue. Alternately, corn and soybean can be grazed by heavy stocker steers from July to October (Lang et al, 2003).

The toxicity of tall fescue has been eliminated with the discovery of novel non-alkaloid producing endophyte lines (Latch (1997; Bouton et al. 2002). The objective of this study was to re-establish non-toxic tall fescue following glyphosate tolerant corn and soybean.

MATERIALS AND METHODS

In early April of 2001 and 2002, glyphosate tolerant corn and soybean were no-tillage planted into pastures containing both tall fescue and warm season perennial grasses on a Bude silt loam soil (fine, silty, mixed, thermic, Glossaquic Fragiudalf) at the Pontotoc Flatwoods-Ridge Experiment Station. Paraquat at 1.5 pts/Acre was applied in April followed by glyphosate at 1.5 qts/Ac in May. New land was utilized each year. Following grain harvest, 'Jessup' MAXQ tall fescue was no-tillage drilled at 25 lbs/Ac in October of each year. There were four replications of each of each planting mixture in a strip-block design across ten soybean herbicide combinations and 15 corn herbicide combinations (reported elsewhere, Shankle et al., 2003). Herbicide treatments were randomized within 10x40" plots within each replicate while strips of 'Mixed' wheat (*Triticum aesitivum*) at 60 lbs/Ac were no-tillage drilled parallel to the rows of tall fescue. Half of each plot was planted to tall fescue alone.

Stand of tall fescue and wheat was determined visually as a percentage of ground cover; botanical composition was estimated visually. Herbage yield was determined by clipping in February and April in 2002 and in March and May in 2003. Data were analyzed as a strip plot design with mean separation by Fisher's LSD (P,0.05).

RESULTS AND DISCUSSION

Soybean yield was 30-35 bu/Ac and corn yield was 90-120 bu/Ac each year (Shankle et al., 2003). Control of existing tall fescue was 90 to 100 % (Triplett et al, 2002). An excellent stand ((82-88 %) of MAXQ tall fescue was obtained in 2002 following corn or soybean (Tables 1 and 2). In 2003 tall fescue stand was good (50-68 %) following corn or soybean (Tables 3 and 4). Inclusion of wheat only slightly reduced tall fescue stand both years, however, the reduction was not substantial.

Inclusion of wheat increased forage yield by 338 % following corn and by 234 % following soybean in 2002. In 2003, inclusion of wheat increased forage production by 212 % following corn, but yield was reduced by inclusion of wheat following soybean by 4.5 %. Total forage yield in 2002 was 188 % greater following soybean compared forage yield following corn. In 2003 total forage yield was 162 % greater following soybean compared with forage yield following corn. This was likely due to soil nitrogen status differences following soybean and corn.

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Table 1. Effect Of Planting Mixture on Tall Fescue Stand and Yield Following Corn at Pontotoc, MS, 2002.

Planting Mixture	TF Stand		TF Yield		Wheat		Total Yield
	February	April	February	April	February	April	
	%		Lb/Acre				
Tall Fescue	78	88	NH†	102	0	0	388
TF + Wheat	60	86	27	78	239	540	1311
LSD (0.05)	5	2	NA‡	27	NA		172

† NH = Not Harvested
‡ NA = Not Applicable

Table 2. Effect Of Planting Mixture on Tall Fescue Stand and Yield Following Soybean at Pontotoc, MS, 2002.

Planting Mixture	TF Stand		TF Yield		Wheat		Total Yield
	February	April	February	April	February	April	
	%		Lb/Acre				
Tall Fescue	84	86	NH	344	0	0	1010
TF + Wheat	75	82	96	266	892	280	2360
LSD (0.05)	8	7	NA	79	NA†		872

† NA = Not Applicable

Table 3. Effect Of Planting Mixture on Tall Fescue Stand and Yield Following Corn at Pontotoc, MS, 2003.

Planting Mixture	TF Stand		TF Yield		Wheat		Total Yield
	March	May	March	May	March	May	
	%		Lb/Acre				
Tall Fescue	51	59	862	1555	0	0	2417
TF + Wheat	39	50	370	868	2701	1193	5132
LSD (0.05)	7	7	241	282	NA†		872

† NA = Not Applicable

Table 4. Effect Of Planting Mixture on Tall Fescue Stand and Yield Following Soybean at Pontotoc, MS, 2003.

Planting Mixture	TF Stand		TF Yield		Wheat		Total Yield
	March	May	March	May	March	May	
	%		Lb/Acre				
Tall Fescue	ND	68	1417	4143	0	0	6275
TF + Wheat	ND	57	966	2823	402	1176	5992
LSD (0.05)		9	147	429	NA†		595

† NA = Not Applicable