

The Effect of the Fungal Endophyte *Acremonium Coenophialum* on Dry Matter Production of Tall Fescue

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Summary

Test plots of 'AU Triumph', 'Ky31,' and 'Kenhy' tall fescue were planted in March 1984 with seed that had been harvested from fields free of (-) and infected (+) with the fungal endophyte, *Acremonium coenophialum*, to determine the effect of this endophyte on dry matter production. The level of infestation has increased over the years and the percent increase in dry matter production also increased with up to 65 percent increase for AU Triumph during the 1987-1988 growing season. The correlation of endophyte level and dry matter production was $r = 0.44, 0.32, 0.33,$ and 0.53 for years 1 through 4, respectively.

Introduction

The first indication that *A. coenophialum* was involved in tall fescue toxicosis occurred in 1977 when Bacon et al. (1) found an association between toxic fescue and the occurrence of the fungus. This has been substantiated by several researchers since that early discovery. In 1986, Read and Camp (3) reported that pastures infested with the endophyte produced more forage than pastures with low infestation. There have been numerous reports of insect resistance and stress tolerance with infected tall fescue used as turfgrass but there has been no test involving the same cultivar with and without the endophyte to substantiate these observations.

This study was undertaken to determine if higher dry matter production could be attributed to endophyte infection using three different cultivars infected and free of the endophyte.

Procedure

Plots of AU Triumph, Kentucky 31, and Kenhy both infected (+) and free (-) of the endophyte were planted in March 1984 on Houston Black clay soil (fine, montmorillonitic, thermic Udic Pellusterts) at the Texas A&M University Research and Extension Center at Dallas. Plot size was 5 x 15 ft with four replications in a randomized block design. Fertilizer was applied at a rate of 84-46-0 lbs/A each fall except for fall 1986 when no fertilizer was applied and for fall 1988 when only nitrogen was applied. A late winter top dress of 100-0-0 lbs/A was applied each year. The level of endophyte infestation of the tall fescue plots were determined cytologically by the method reported by Bacon et al. (1). Ten randomly selected stems from each plot was examined except in 1986, when 20 stems were examined for the fungus. Plots were harvested four times during the 1984-1985 growing season, three times during the 1985-1986 season, and twice during the remaining 2 years. Plots were harvested, weighed, subsamples taken and oven-dried at 60°C, and percent dry matter and per acre dry matter yields calculated. Analysis of variance and correlations were determined using PC SAS. Endophyte level of 1985 was correlated with 1984-1985 yield and 1986 endophyte level with 1985-1986 and so on.

Results and Discussion

In 1984, the year of establishment, AU Triumph (+) had a very low level of infection and the Ky 31 (1) had a low level of infection. Only Kenhy had the levels of infection that was hoped for with 60 percent for the (+) and 0 percent for the (-) (Table 1). There has been a trend for the level of infection to increase in all cultivars except for Kenhy (-) which has remained free of the endophyte. The erratic nature of the percent infection by this endophyte in tall fescue follows the pattern reported by Pedersen et al. (2) and Read and Camp (3). Dry matter production has been low for the last 3 years (Table 2) due primarily to drier than normal rainfall during the fall. In every case forage production has been higher for the endophyte-infested plots. The correlation of endophyte level and dry matter production was $r = 0.44, 0.32, 0.33,$ and 0.53 for 1984-1985, 1985-1986, 1986-1987, and 1987-1988 growing seasons, respectively. When the percent increase in dry matter production is calculated (Table 3) this increase follows very closely the level of infestation of the plots. The percent increase in infestation increased sharply in 1988 (Table 1) and the increase in production due to the endophyte also increased during the 1987-1988 growing season except for Ky 31. The probable cause for decrease in percent increase in production due to the endophyte was the corresponding increase in infestation of the Ky 31 (-) plots. In summary, the level of the endophyte tends to increase over time and there is a trend for the difference in production to follow the difference in the level of infestation of the tall fescue plots.

Cultivar	Endophyte	Level of Infection				
		1984	1985	1986	1987	1988
		———— percent ————				
A U Triumph	+	7c	0b	5c	13b	53b
	-	0c	0b	0c	2b	0c
Ky 31	+	43b	55a	45b	58a	73b
	-	5c	3b	0c	5b	18c
Kenhy	+	60a	45a	76a	73a	98a
	-	0c	0b	0c	0b	0c

Means with a common letter are not significantly different at the 0.05 level.

Cultivar	Endophyte	Dry Matter Production			
		1984-85	1985-86	1986-87	1987-88
		———— lbs/A ————			
A U Triumph	+	9,180ab	1,660ab	920a	3,380a
	-	8,490bc	1,410b	750b	2,050bc
Ky 31	+	9,600a	2,020a	920a	2,680ab
	-	8,270c	138b	72b	227bc
Kenhy	+	8,370bc	1,400b	740b	2,730ab
	-	7,830c	1,070b	580b	1,710c

Means with a common letter are not significantly different at the 0.05 level.

Cultivar	Percent Increase			
	1984-85	1985-86	1986-87	1987-88
	———— percent ————			
AU Triumph	8	18	23	65
Ky 31	16	46	28	18
Kenhy	7	31	28	60

Literature Cited

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