ESTABLISHMENT VIGOR OF ENDOPHYTE FREE AND ENDOPHYTE INFECTED TALL FESCUE CULTIVARS IN SOUTHERN OHIO

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ABSTRACT
Eleven cultivars of tall fescue (*Festuca arundinacea,* Schreb.) and two cultivars of orchardgrass (*Dactylis glomerata* L.) are part of a study to evaluate yield, establishment vigor, persistence and palatability under autumn stockpiling conditions. Included in the study are two endophyte infected-cultivars of tall fescue to compare interactions with endophyte free and infected cultivars. The results demonstrate that the newer endophyte-free and low-endophyte tall fescue cultivars evaluated are similar to other orchardgrass and endophyte-infected tall fescue cultivars in establishment vigor and early growth the year following establishment.

KEYWORDS
Tall fescue, yield, stand, vigor, endophyte, persistence, palatability

INTRODUCTION
Tall fescue for grazing livestock is commonly considered a versatile and persistent perennial forage. Tall fescue was first planted on a wide-spread basis in the USA in the 1940's, and now occupies some 14 million hectares. Most of the tall fescue stands in Southern Ohio are Kentucky 31 fescue with a 70-85 percent infection level of an endophyte (*Acremonium coenophialum*) which can have associated adverse Effects on livestock performance. An endophyte is a plant which grows within another plant, in this case a fungus growing within the fescue. The term fescue toxicosis is often used to describe the adverse symptoms caused by the toxin (ergovaline) produced by the endophyte.

Grazing studies by Dr. Blaser (1986), dating back to 1956 reported usual beef steer gains of 0.45 kg per day while grazing tall fescue. Studies by Hoveland *et al.,* (1983) note that steer gains are reduced from 0.83 kg per day on low-endophyte infected pastures to 0.45 kg per day on high-endophyte infected pastures. Studies from Putnam *et al.,* (1990) reported that many mares grazing infected tall fescue exhibited reproductive abnormalities.

Tall fescue is the most desirable grass to stockpile for late autumn and winter grazing (Hall, 1993). During the autumn, this species produces higher yields of stockpiled forage of superior quality compared to other cool season grasses. The fall-saved forage is very palatable and high in digestibility (high in soluble sugars) and maintains quality longer into the winter (Penrose, Bartholomew and Sulc, 1994).

Farmers are reluctant to attempt eradication of endophyte-infected fescue and reseed with new cultivars of endophyte free tall fescue. Seeding failures and poor stand durability are the most cited reasons for not trying new cultivars of tall fescue with low-endophyte levels. It is also difficult to eradicate endophyte-infected tall fescue from pastures and prevent reintroduction from surviving rhizomes and seed in the soil. New cultivars of endophyte free and low endophyte tall fescue have a great potential to increase animal performance during the summer grazing season as well as provide adequate forage quality for beef cattle and sheep during the winter months which can greatly reduce stored feed costs and increase profitability (Fowler and Stout, 1990).

There is a clear need to test for durability, palatability, yield and persistence of endophyte-free and low-endophyte infected tall fescue cultivars. The purpose of this study is to compare low endophyte-infected and endophyte-free tall fescue cultivars with endophyte-infected tall fescue cultivars and orchardgrass. This paper only presents initial establishment data for yield and persistence. Another study initiated on the same date will compare palatability, durability and stockpiling qualities.

METHODS
The field trial was established in 1995 at the Ohio Agricultural Research and Development Center's Jackson Branch in southeast Ohio. The soil is a Rarden silt loam. Soil pH was 6.0, available P was 23 ppm, and exchangeable K was 118 ppm. The experiment was seeded on 5 September 1995 with a no-till drill following suppression of the existing vegetation with paraquat dichloride (1,1'-dimethyl-4, 4'-bipyridinium). At planting, 50 kg/ha of P was applied through the drill. Plot size was 1.8 x 6.0 m. Thirteen grass cultivars currently on the market in the U.S. were included: nine were low or endophyte-free tall fescue, two were endophyte-infected tall fescue, and two were orchardgrass. Seeding rate was 11.2 kg/ha. A randomized complete block design with three replications was used. On 1 October 1995, 67 kg/ha of N was applied, and an additional 45 kg/ha of N was applied on 26 April 1996. Broadleaf weeds were controlled in the plot area with 2,4-D amine (2,4-dichlorophenoxyacetic acid, dimethylamine salt) and dimethylamine salt of dicamba (3,6-dichloro-o-anisic acid) on 2 May 1996.

Vigor and stand density of the grass cultivars were visually rated on 1 November 1995 and 1 May 1996. Vigor was rated from 1 = dead to 10 = vigorous growth. Stand density was rated as percentage ground cover in the seeded rows. Forage yield was determined on 31 May 1996 by clipping a 0.6 x 6.0 m strip from the center of each plot at a clipping height of 7 to 8 cm. Samples were collected from each plot and dried at 60^0 C to determine dry matter percentage, and used to convert forage fresh weight to dry weight. Analysis of variance was performed on each set of data using the SAS-Proc Anova procedure (SAS Institute, 1988). Separation of cultivar means was accomplished by Fisher's protected LSD.

RESULTS AND DISCUSSION
Initial vigor and stand density in November, 1995 demonstrates that all cultivars were successfully established prior to a killing frost (Table 1). Vigor and stand differences among cultivars were small and not significant. The following spring, all cultivars were similar in vigor of growth as visually rated on 1 May 1996; however, there were small but significant differences in stand density among cultivars (Table 1). Benchmark orchardgrass had the highest stand density which was significantly higher than five other cultivars. Endophyte-free Jessup had the lowest stand density on 1 May 1996, which was significantly lower than the stand density of ten other cultivars including endophyte-infected Jessup. Endophyte-free

Kentucky 31 had similar stand density as endophyte-infected Kentucky 31.

The cultivars did not differ significantly in forage yield at the first harvest in 1996 (Table 2). This demonstrates that the differences in stand density among cultivars observed in early May were relatively small and did not translate to differences in forage yield 4 weeks later. On 9 May 1996, all cultivars except Barcel were in reproductive stages of growth (data not shown). At that time, Barcel was observed to have fine leaf growth and delayed maturity. On 31 May 1996, Barcel was still delayed in maturity compared with the other cultivars, which possibly explains the lower numerical yield of this cultivar, although the difference was not statistically significant. These data demonstrate that the newer endophyte-free and low-endophyte tall fescue cultivars currently on the market are similar to other grass cultivars in establishment vigor and early growth the year following establishment. This study is being continued to evaluate yield and persistence under a traditional three-cut hay management system. In addition, a second study was established on the same date to evaluate stockpiled yields for winter grazing, persistence under winter and summer grazing, and palatability of these cultivars for beef cattle.

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Table 1
Vigor and Stand Density of 13 Grass Cultivars in the Year of Establishment and Following Spring

Cultivar	1/11/95		1/5/96	
	Vigor[1]	Stand[2]	Vigor	Stand[3]
Tall Fescue				
AU Triumph	7.8	83	8.5	97 ab
Phyter	7.3	82	8.3	88 abcd
Ky 31 (endophyte infected)	6.8	78	8.2	87 bcd
Stargrazer	8.0	80	8.0	85 cd
Ky 31 (endophyte free)	8.3	87	8.2	97 ab
Festorina	7.0	75	7.7	82 de
Jessup (endophyte free)	6.7	75	7.0	72 e
Barcel	7.3	85	7.2	95 abc
Fawn	9.0	90	9.0	97 ab
Martin	7.7	72	8.7	78 de
Jessup (endophyte infected)	7.2	79	7.3	88 abcd
Orchardgrass				
Benchmark	8.7	93	8.8	98 a
Warrior	8.5	91	8.0	93 abc
Pr>F				0.01
LSD (0.05)	NS[4]	NS	NS	1.1

[1]Vigor was rated visually from 1 = dead to 10 = vigorous growth.
[2] Visual rating of percent ground cover within the seeded rows.
[3]Means with the same letter are not significantly different.
[4] NS = Not significant

Table 2
Dry Matter Yields of Initial Harvest on 31/5/96

Cultivar	Dry Matter %	Dry Matter Yield Kg/ha
Tall Fescue		
Au Triumph	28.69	1627
Phyter	27.60	2017
Ky 31 (endophyte infected)	28.25	1835
Stargrazer	26.36	2202
Ky 31 (endophyte free)	26.01	2340
Festorina	27.93	2130
Jessup (endophyte free)	27.94	1903
Barcel	27.29	1607
Fawn	29.62	2130
Martin	28.13	1713
Jessup (endophyte infected)	26.83	1725
Orchardgrass		
Benchmark	27.27	1853
Warrior	26.90	1853
LSD (0.05)	NS[1]	NS

[1]NS = Not Significant