

**EFFECT OF LEGUME PERSISTENCE IN  
ENDOPHYTE-INFECTED TALL FESCUE PASTURES ON  
FORAGE PRODUCTION AND STEER PERFORMANCE**

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**Summary**

A total of 135 steers grazed high-endophyte tall fescue pasture in 1998, 1999, and 2000 that had been previously interseeded with either lespedeza, red clover, or ladino clover during 1995, 1996, and 1997. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Pastures interseeded with ladino clover produced higher stocker gains in 1998 and more available forage and legume cover in all 3 years than those interseeded with lespedeza or red clover. Legume treatment had little effect on subsequent finishing performance. Results of this study indicate that lespedeza and red clover should be seeded every year and ladino clover at least every 2 years in endophyte-infected tall fescue pasture in order to provide sufficient legume to improve performance of grazing cattle.

(Key Words: Grazing, Tall Fescue, Endophyte, Legumes, Interseeding, Finishing.)

**Introduction**

Cattlemen with high-endophyte tall fescue pastures can either tolerate low gains from their cattle, seek to improve animal performance by destroying existing stands of fescue and replacing them with endophyte-free fescue or other forages, or

interseed legumes into existing pastures to reduce the adverse effects of endophyte on animal performance. Previous research at the Southeast Agricultural Research Center has shown that performance of stocker steers grazing high-endophyte tall fescue improved significantly when 'Regal' ladino clover was broadcast on the pastures in late winter, and that interseeding ladino clover into existing stands of high-endophyte tall fescue produced higher grazing gains than interseeding lespedeza or red clover. This study was conducted to compare legume persistence, forage production, grazing performance, and subsequent feedlot performance of stocker steers grazing high-endophyte tall fescue pastures that had been previously interseeded with ladino clover, lespedeza, or red clover.

**Experimental Procedures**

**Pastures.** Nine 5-acre pastures located at the Parsons Unit of the Kansas State University-Southeast Agricultural Research Center on a Parsons silt loam soil were used in a randomized complete block design containing three replications. The pastures of established (>5-yr) 'Kentucky 31' tall fescue had more than 65% infection rate with the endophyte, *Neotyphodium coenophialum* (formerly called *Acremonium coenophialum*). Pastures were fertilized in September 1998, 1999, and 2000 with 16-40-40 lb/a of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O. Pastures were treated in early spring of

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1994 with 3 tons/acre of ag lime (62% effective calcium carbonate). Three legumes were seeded in late February 1995 with a no-till drill. Three pastures each received 4 lb/acre of Regal ladino clover, 12 lb/acre of 'Kenland' red clover, or 15 lb/acre of 'Marion' striate lespedeza. Pastures were seeded again in mid-March of 1996 and early March of 1997 with the same respective legumes that were planted in 1995, except that Korean rather than Marion lespedeza was planted. Seeding rates in 1996 were 6 lb/acre of Regal ladino clover, 13 lb/acre of Kenland red clover, or 17 lb/acre of Korean lespedeza. Seeding rates in 1997 were 4 lb/acre of Regal ladino clover, 12 lb/acre of Kenland red clover, or 14 lb/acre of Korean lespedeza.

Available forage was determined at the initiation of grazing and periodically during the season with a disk meter calibrated for tall fescue. Three exclosures (15-20 ft<sup>2</sup>) were placed in each pasture; total production was estimated from three readings per exclosure, and available forage was determined from three readings near each cage. Legume canopy coverage was estimated from the percentage of the disk circumference that contacted a portion of the canopy.

**Grazing Steers.** In 1998, 1999, and 2000, 45 mixed-breed steers were weighed on consecutive days, stratified by weight, and allotted randomly to the nine pastures. Grazing was initiated on April 1 in 1998, March 30 in 1999, and April 4 in 2000. Initial steer weights were 573 lbs in 1998, 565 lbs in 1999, and 553 lbs in 2000. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. Steers were fed 2 lb of ground grain sorghum per head daily and had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. One steer was removed from one of the lespedeza

pastures in 1998, one from one of the ladino clover pastures in 1999, and one from one of the red clover pastures in 2000 for reasons unrelated to experimental treatment. Pastures were grazed continuously at a stocking rate of 1 head/acre. Grazing was terminated and steers were weighed on November 9 and 10 (223 days) in 1998, November 3 and 4 (218 days) in 1999, and November 7 and 8 (218 days) in 2000.

Following the grazing period, cattle were shipped to a finishing facility and fed a diet containing 80% ground milo, 15% corn silage, and 5% supplement (dry basis). Steers were implanted with Synovex S<sup>®</sup> on days 0 and 84 of the finishing period. Cattle grazed during 1998, 1999, and 2000 were fed a finishing diet for 154, 140, and 111 days, respectively. They were slaughtered in a commercial facility and carcass data were collected.

## Results and Discussion

**Pastures.** Available forage dry matter of the pastures for 1998, 1999, and 2000 is presented in Figures 1, 2, and 3, respectively. Available forage dry matter was higher in pastures that had been interseeded with ladino clover than in those with lespedeza in all 3 years, and higher than those with red clover in 1999 and 2000.

Legume canopy coverage for 1998, 1999, and 2000 is presented in Figures 4, 5, and 6, respectively. Greater legume coverage was maintained in each of the 3 years in pastures that were previously interseeded with ladino clover than in those with red clover or lespedeza. However, legume coverage declined each year with only an average of 1.3% remaining in ladino clover pastures in 2000.

**Cattle Performance.** Grazing and subsequent finishing performance of steers grazing fescue pastures in 1998, 1999, and

2000 that had been previously interseeded with the various legumes are presented in Table 1. Results are listed by year for each legume treatment, since there was a significant ( $P<0.05$ ) treatment  $\times$  year interaction. In 1998, steers grazing pastures interseeded with ladino clover gained 33.3% more ( $P<0.05$ ) and 20.4% more ( $P<0.05$ ) than those grazing pastures interseeded with lespedeza and red clover, respectively. Gains of steers grazing pastures interseeded with lespedeza or red clover were similar ( $P>0.05$ ). In 1999 and 2000, grazing gains among legume treatments were similar ( $P>0.05$ ).

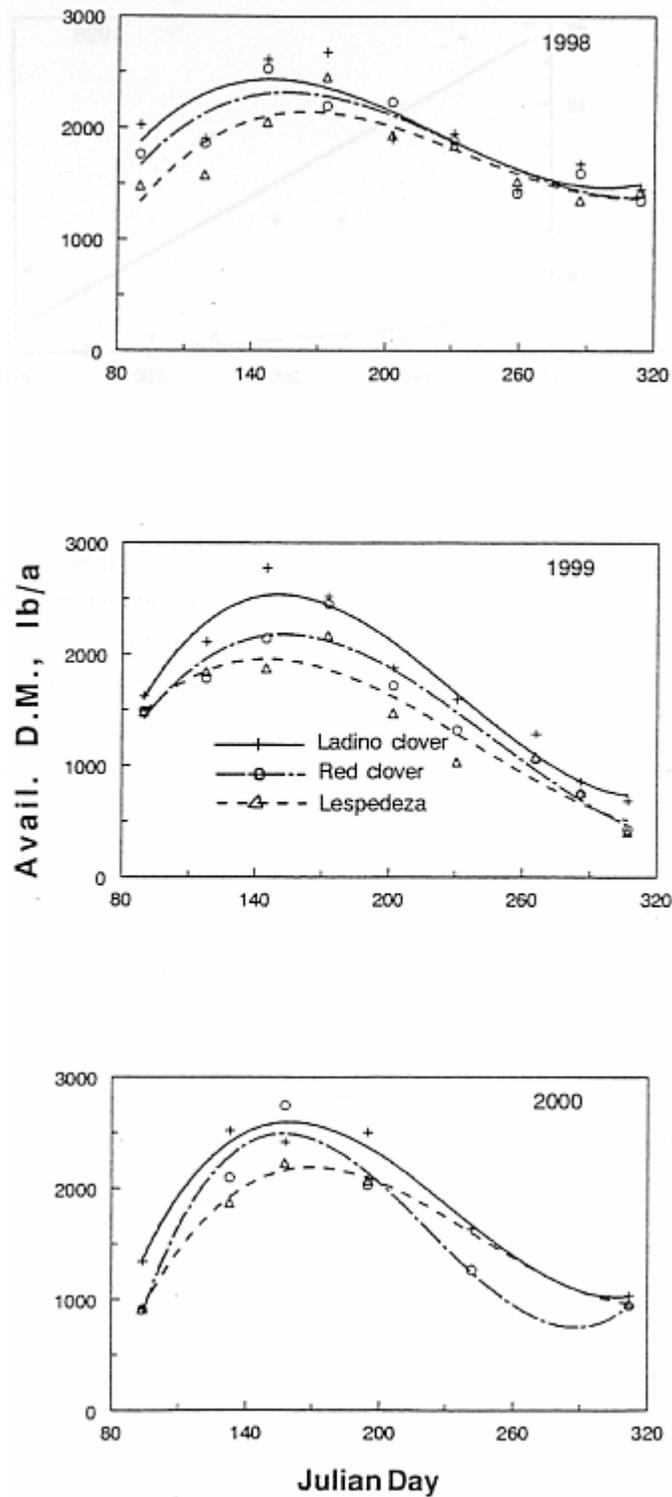
Legume treatment during the grazing phase had no effect on subsequent finishing

performance or carcass parameters except steers that grazed pastures interseeded with red clover in 1998 gained 9.1% more ( $P<0.05$ ) than those that grazed pastures interseeded with ladino clover. This may have been compensatory gain, as cattle that grazed pastures interseeded with ladino clover gained more ( $P<0.05$ ) than those grazing pastures interseeded with red clover during the grazing phase. Finishing performance of steers that had previously grazed pastures interseeded with lespedeza or red clover were similar ( $P>0.05$ ). Overall gains from the beginning of the grazing phase through the end of the finishing phase were similar between legume treatments during each of the 3 years.

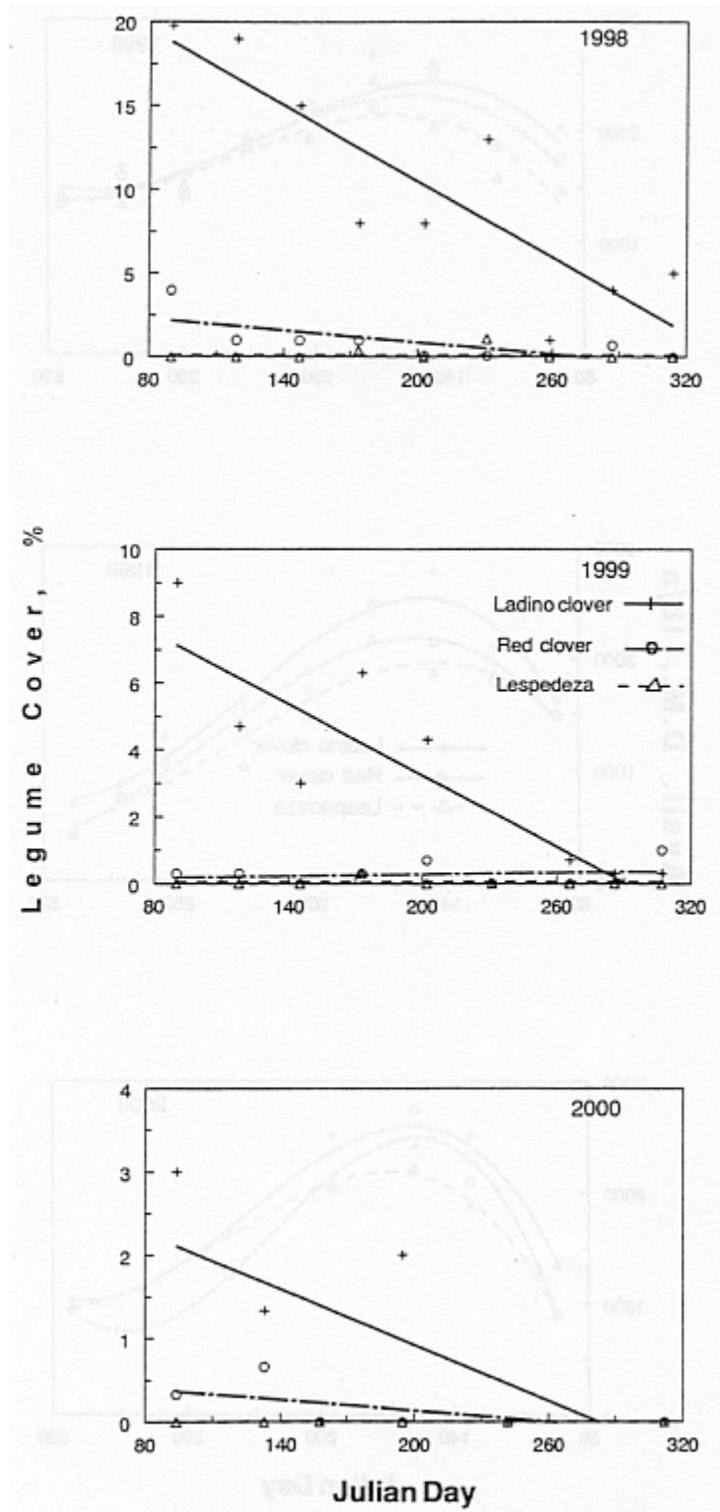
**Table 1. Effects of Interseeding Legumes into Endophyte-Infected Fescue Pastures on Performance of Steers, Southeast Agricultural Research Center**

| Item   | 1998               |                   |                   | 1999             |                  |                  | 2000             |                  |                  |
|--|--------------------|-------------------|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|  | Legume             |                   |                   | Legume           |                  |                  | Legume           |                  |                  |
|  | Lespedez<br>a      | Red<br>Clover     | Ladino<br>Clover  | Lespede<br>za    | Red<br>Clover    | Ladino<br>Clover | Lespede<br>za    | Red<br>Clover    | Ladino<br>Clover |
| <b>Grazing Phase</b>                                   |                    |                   |                   |                  |                  |                  |                  |                  |                  |
| No. of days  | 223                | 223               | 223               | 218              | 218              | 218              | 218              | 218              | 218              |
| No. of head  | 14                 | 15                | 15                | 15               | 15               | 14               | 15               | 14               | 15               |
| Initial wt., lb  | 572                | 574               | 573               | 565              | 565              | 565              | 552              | 549              | 552              |
| Ending wt., lb   | 779 <sup>a</sup>   | 803 <sup>a</sup>  | 849 <sup>b</sup>  | 775              | 784              | 779              | 774              | 792              | 780              |
| Gain, lb   | 207 <sup>a</sup>   | 230 <sup>a</sup>  | 276 <sup>b</sup>  | 210              | 219              | 214              | 223              | 243              | 229              |
| Daily gain, lb   | 0.93 <sup>a</sup>  | 1.03 <sup>a</sup> | 1.24 <sup>b</sup> | 0.97             | 1.01             | 0.98             | 1.02             | 1.12             | 1.05             |
| <b>Finishing Phase</b>                                 |                    |                   |                   |                  |                  |                  |                  |                  |                  |
| No. of days  | 154                | 154               | 154               | 140              | 140              | 140              | 111              | 111              | 111              |
| No. of head  | 14                 | 15                | 15                | 15               | 15               | 14               | 15               | 14               | 15               |
| Starting wt., lb                                       | 779 <sup>a</sup>   | 803 <sup>a</sup>  | 849 <sup>b</sup>  | 775              | 784              | 779              | 774              | 792              | 780              |
| Final wt., lb  | 1296               | 1340              | 1341              | 1322             | 1320             | 1344             | 1216             | 1221             | 1204             |
| Gain, lb   | 517 <sup>a,b</sup> | 537 <sup>a</sup>  | 492 <sup>b</sup>  | 547              | 535              | 565              | 441              | 429              | 424              |
| Daily gain, lb   | 3.36               | 3.48              | 3.19              | 3.90             | 3.82             | 4.03             | 3.98             | 3.86             | 3.82             |
| Daily DM intake, lb                                    | 25.0               | 26.3              | 25.8              | 27.1             | 28.2             | 27.8             | 27.7             | 27.4             | 28.8             |
| Feed/gain  | 7.4                | 7.6               | 8.1               | 6.9              | 7.4              | 6.9              | 7.0              | 7.1              | 7.6              |
| Hot carcass wt., lb                                    | 790                | 813               | 817               | 790              | 800              | 808              | 706              | 720              | 696              |
| Dressing %   | 61.0               | 60.7              | 60.9              | 59.7             | 60.6             | 60.1             | 58.1             | 58.9             | 57.8             |
| Backfat, in  | .39                | .38               | .40               | .51              | .44              | .45              | .41              | .42              | .43              |
| Ribeye area, in <sup>2</sup>                           | 16.0               | 15.5              | 15.3              | 12.0             | 12.2             | 12.3             | 11.6             | 11.4             | 11.7             |
| Yield grade  | 1.8                | 2.0               | 2.1               | 3.3              | 3.1              | 3.1              | 3.0              | 3.1              | 2.9              |
| Marbling score   | SM <sup>10</sup>   | SM <sup>79</sup>  | SM <sup>62</sup>  | MT <sup>19</sup> | SM <sup>70</sup> | MT <sup>22</sup> | SM <sup>01</sup> | SM <sup>10</sup> | SL <sup>95</sup> |
| % Choice   | 62                 | 80                | 67                | 92               | 73               | 100              | 40               | 42               | 47               |
| <b>Overall Performance (Grazing + Finishing Phase)</b> |                    |                   |                   |                  |                  |                  |                  |                  |                  |
| No. of days  | 377                | 377               | 377               | 358              | 358              | 358              | 329              | 329              | 329              |
| Gain, lb   | 724                | 767               | 768               | 757              | 755              | 779              | 664              | 672              | 652              |
| Daily gain, lb   | 1.92               | 2.03              | 2.04              | 2.12             | 2.11             | 2.18             | 2.02             | 2.04             | 1.98             |

<sup>a,b</sup>Means within a row within the same year with the same letter are not significantly different ( $P<0.05$ ).



**Figure 1. Available Forage in Tall Fescue Pastures Previously Interseeded with Legumes, Southeast Agricultural Research Center. Day 80 is March 21, day 320 is November 16.**



**Figure 2. Legume Canopy Cover in Tall Fescue Pastures Previously Interseeded with Legumes, Southeast Agricultural Research Center. Day 80 is March 21, day 320 is November 16.**