# EFFECT OF INTERSEEDING LEGUMES INTO 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 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. Legume treatment caused no differences in forage availability. Grazing gains corresponded to the amount of legume coverage present. Results of this study indicate that interseeding high endophyte fescue pastures with ladino clover produced higher stocker gains during the grazing phase than interseeding with lespedeza or red clover. Legume treatment had no effect on subsequent finishing gains.


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

## Introduction

Cattlemen with high-endophyte tall fescue pastures can either tolerate low gains, seek to improve performance by replacing existing fescue stands with endophyte-free fescue or other forages, or interseed legumes into existing pastures to reduce the adverse effects. 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. Lespedeza and red clover also are grown widely in southeastern Kansas. Information comparing grazing performance on these legumes with ladino clover interseeded in high-endophyte tall fescue is limited. This study was conducted to compare legume establishment, forage production, grazing performance, and subsequent feedlot performance of stocker steers grazing high-endophyte tall fescue pastures 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 (fine, mixed thermic Mollic Albaqualf) were used in an experiment with a randomized complete block design containing three replications. The pastures of established (>5-yr) `Kentucky 31N tall fescue were more than 65% infected with the endophyte *Neotyphodium coenophialum* Glen, Bacon, Price, and Hanlin (formerly *Acremonium coenophialum*). Pastures were fertilized in September 1994 with 40-40-40 and in September 1995, 1996, and 1997 with 16-40-40 lb/acre of N-$P_2O_5$-$K_2O$. Pastures were treated in early spring of 1994 with 3 tons/acre of ag lime (62% ECC). The 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 `KenlandN 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 legumes planted in 1995, except that Korean rather

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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 during the season with a disk meter calibrated for tall fescue. Three exclosures (15-20 $ft^2$) 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 1995, 1996, and 1997, 45 mixed-breed steers were weighed on consecutive days, stratified by weight, and allotted randomly to the nine pastures. Grazing was initiated on March 31, 1995; April 24, 1996; and April 1, 1997. Initial weights were 690 lb in 1995, 524 lb in 1996, and 516 lb in 1997. Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. Steers grazed for 200 days in 1995, 168 days in 1996, and 220 days in 1997. 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. Grazing was terminated and steers were weighed on October 16 and 17 in 1995, October 8 and 9 in 1996, and November 6 and 7 in 1997.

Following the grazing period, cattle were shipped to a finishing facility and fed a diet containing 80% ground grain sorghum, 15% corn silage, and 5% supplement on a dry matter basis. Steers were implanted with Synovex S® on days 0 and 84 of the finishing period. Cattle grazed during 1995, 1996, and 1997 were fed finishing diets for 164, 139, and 154 days, respectively, and were slaughtered in a commercial facility. Carcass data were collected.

## Results and Discussion

**Pastures**. Available, total, forage dry matter and legume coverage of the pastures for 1995, 1996, and 1997 are presented in Figures 1, 2, and 3, respectively. Legume treatment caused no differences in forage availability during any year. However, total forage availability was less in 1996 than in 1995 and 1997, perhaps because of a reduction in the density of the fescue stand caused by the extremely cold and dry winter of 1995-96. In 1997, total forage dry matter production and legume coverage were both higher than in previous years because of the favorable rainfall pattern.

In 1995, canopy coverages of legumes were generally less than 10%. Stands of legumes likely were diminished by extremes of spring drought followed by wet soils in early summer and drought again in late summer. Coverage was higher ($P<.05$) in red clover-seeded pastures than in other legume pastures in March and April, but coverage was greatest in the lespedeza pastures by the end of June. Lespedeza coverage in cages appeared higher than for the other legumes at the end of summer, but this was not significant ($P>.20$). In 1996, cover was higher for lespedeza than for red or ladino clover. Cover was highest for lespedeza and lowest for red clover during July and August. In 1997, cover for most of the season was higher for ladino clover than for red clover or lespedeza, particularly during July and August.

## Cattle Performance

Grazing and subsequent finishing performances of steers grazing fescue pastures interseeded with the various legumes in 1995, 1996, and 1997 are presented in Table 1. Results are listed by year for each legume treatment, because a significant ($P < .05$) treatment x year interaction occurred. Differences in grazing performance due to legume treatment increased each year during the duration of the study. Steers grazing pastures interseeded with lespedeza or ladino clover had identical ($P = .82$ and $P = .93$) gains in 1995 and 1996, respectively. In 1995, steers grazing red clover gained 11.3% less ($P = .13$) and 10.4% less ($P = .19$) than those grazing lespedeza and ladino clover, respectively. In 1996, steers grazing red clover gained 12.1% less ($P = .08$ and $P = .07$) than those grazing lespedeza and ladino clover, respectively. In 1997, steers grazing pastures interseeded with ladino clover gained 35.6% more ($P = .0001$) and 28.1% more ($P = .0001$) than those grazing pastures interseeded with lespedeza and red clover, respectively. Gains of steers grazing pastures interseeded with red clover or lespedeza were similar ($P = .26$).

Subsequent finishing gains and feed efficiencies were similar among legume treatments during all 3 years. Few differences in carcass measurements were observed for cattle grazing in 1995 and 1996. However, steers that grazed ladino clover during 1997 had heavier ($P = .0002$ and $P = .0004$) hot carcass wt., greater ($P = .01$ and $P = .03$) fat thickness, and higher ($P = .01$ and $P = .02$) numerical yield grade than steers that had grazed pastures interseeded with lespedeza and red clover, respectively. Steers that grazed lespedeza in 1997 had lower ($P = .02$ and $P = .004$) marbling scores and fewer ($P = .03$ and $P = .01$) percent choice carcasses than those that grazed red clover and ladino, respectively.

Overall gains (grazing plus finishing phase) were similar among legume treatments during 1995 and 1996. However, steers that grazed ladino during 1997 had higher ($P = .008$ and $P = .01$) overall gains than those that grazed red clover and lespedeza, respectively.

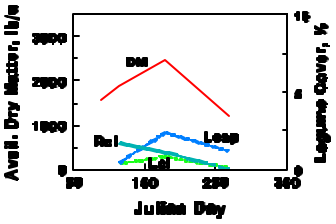


**Figure 1. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1995, Southeast Agricultural Research Center.**

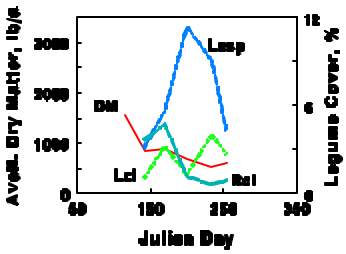


**Figure 2. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1996, Southeast Agricultural Research Center.**

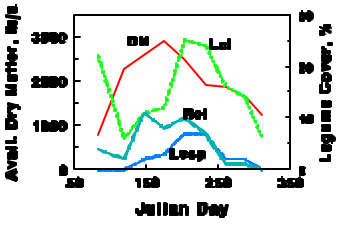


**Figure 3. Available Forage and Legume Canopy Cover in Tall Fescue Pastures, 1997, Southeast Agricultural Research Center.**

**Table 1. Effects of Interseeding Legumes into Endophyte-Infected Fescue Pastures on Performance of Steers**

| | 1995 | | | 1996 | | | 1997 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Legume | | | Legume | | | Legume | | |
| Item | Lespedeza | Red Clover | Ladino Clover | Lespedeza | Red Clover | Ladino Clover | Lespedeza | Red Clover | Ladino Clover |
| Grazing Phase | | | | | | | | | |
| No. of days | 200 | 200 | 200 | 168 | 168 | 168 | 220 | 220 | 220 |
| No. of head | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Initial wt., lb | 690 | 694 | 691 | 524 | 524 | 524 | 512 | 517 | 519 |
| Ending wt., lb | 926 | 906 | 924 | 757 | 733 | 758 | 813[a] | 838[a] | 930[b] |
| Gain, lb | 236 | 212 | 233 | 233 | 209 | 234 | 301[a] | 321[a] | 411[b] |
| Daily gain, lb | 1.18 | 1.06 | 1.17 | 1.39 | 1.24 | 1.39 | 1.37[a] | 1.46[a] | 1.87[b] |
| Finishing Phase | | | | | | | | | |
| No. of days | 164 | 164 | 164 | 139 | 139 | 139 | 154 | 154 | 154 |
| No. of head | 15 | 15 | 15 | 14 | 15 | 14 | 15 | 15 | 15 |
| Starting wt., lb | 926 | 906 | 924 | 762[a,b] | 733[a] | 763[b] | 813[a] | 838[a] | 930[b] |
| Final wt., lb | 1404 | 1386 | 1367 | 1223 | 12071227 | 1318[a] | 1313[a] | 1408[b] | |
| Gain, lb | 478 | 480 | 443 | 461 | 474 | 464 | 505 | 475 | 478 |
| Daily gain, lb | 2.91 | 2.93 | 2.70 | 3.31 | 3.41 | 3.34 | 3.28 | 3.08 | 3.10 |
| Daily DM intake, lb | 25.7 | 25.0 | 25.2 | 23.5 | 23.5 | 23.6 | 25.5 | 25.7 | 26.1 |
| Feed/gain | 8.9 | 8.6 | 9.4 | 7.1 | 6.9 | 7.1 | 7.8 | 8.3 | 8.4 |
| Hot carcass wt., lb | 867 | 862 | 844 | 756 | 735 | 761 | 781[a] | 789[a] | 858[b] |
| Dressing % | 61.8 | 62.1 | 61.7 | 61.8[a] | 60.9[b] | 62.1[a] | 59.2[a] | 60.1[a,b] | 60.9[b] |
| Backfat, in | .44 | .46 | .49 | .29 | .30 | .24 | .41[a] | .45[a] | .56[b] |
| Ribeye area, $in^2$ | 14.5 | 14.1 | 14.0 | 14.9[a] | 14.0[a] | 16.2[b] | 12.4 | 12.3 | 13.0 |
| Yield grade | 2.3[a,b] | 2.1[a] | 2.5[b] | 1.7 | 1.6 | 1.3 | 2.9[a] | 3.0[a] | 3.5[b] |
| Marbling score | SM[63] | SM63 | SM[89] | SM[21a] | SM[03a,b] | SL[59b] | SM[21a] | SM[97b] | MT[22b] |
| % Choice | 87 | 80 | 87 | 57 | 40 | 43 | 67[a] | 93[b] | 100[b] |
| Overall Performance (Grazing + Finishing Phase) | | | | | | | | | |
| No. of days | 364 | 364 | 364 | 307 | 307 | 307 | 374 | 374 | 374 |
| Gain, lb | 714 | 692 | 677 | 698 | 683 | 702 | 806[a] | 796[a] | 889[b] |
| Daily gain, lb | 1.96 | 1.90 | 1.86 | 2.27 | 2.22 | 2.29 | 2.15[a] | 2.13[a] | 2.38[b] |

[a,b]Means within a row within the same year with the same letter are not significantly different (P<.05).