2002

Pasture Enhancement of Warm-season Grass Pastures Using a Complex Mixture of Legumes

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Abstract
The main goal of pasture management is to balance forage supply with livestock requirements. By establishing warm-season grasses in conjunction with cool-season pastures, the overall efficiency of forage growth is improved for livestock production. Legume establishment in these pastures can enhance the overall efficiency of the pastures because the addition of legumes to the warm-season grass mixtures can help to improve forage quality and reduce the amount of nitrogen fertilizer that is needed.

Keywords
Agronomy, Animal Science

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Animal Sciences

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Introduction

The main goal of pasture management is to balance forage supply with livestock requirements. By establishing warm-season grasses in conjunction with cool-season pastures, the overall efficiency of forage growth is improved for livestock production. Legume establishment in these pastures can enhance the overall efficiency of the pastures because the addition of legumes to the warm-season grass mixtures can help to improve forage quality and reduce the amount of nitrogen fertilizer that is needed.

Materials and Methods

A mixture of 15 legumes (Table 1) was interseeded into existing switchgrass (*Panicum virgatum* L., cv. Cave-in-Rock) and big bluestem (*Andropogon gerardii*, Vitman, cv. Rountree) pastures in late summer of 1998. The legumes chosen represent species with varying life cycles and growth habits (Table 1). Grazing was delayed until summer of 1999 to allow the legumes to develop a seed bank.

The experimental design is a split plot, with half of each pasture consisting of legumes and the other half left in grass. Animals were placed on the pastures mid-June and removed mid-August for 1999, 2000, and 2001. Cattle weights were determined before and after each grazing season. Pasture samples were collected from paddocks to determine the quantity of available forage. Legume composition was identified using the Gillen and Smith dry-weight rank method to sample 100 random points per pasture.

Preliminary Results and Discussion

Legume composition was estimated for the 2001 season. Of the pastures containing legumes (Figure 1), a relatively high percent legume was recorded, which indicates persistence of legumes in the grass/legume pastures. Preliminary data for mean cattle gains are shown in Table 2. For 1999 and 2000, big bluestem/legume pastures showed the highest gain. For the most part, there was not a substantial difference between the treatments for the first two years. Gains in 2001 were higher for the switchgrass and switchgrass/legume pastures. Overall gains were lower than in the other years. The grass/legume mixtures were expected to show the highest gains. However, some of the pastures did have significant volunteer legumes and cool-season grasses present. This may explain the difference in gains over the past three years, but more detailed analysis is required. Due to an encroachment of cool-season grass in warm-season pastures, cool-season grass samples will be analyzed to help understand the variation in cattle gains for warm-season grass pastures. In general, cattle gains over the summer months provide evidence of the improved pasture productivity.

This data should be considered preliminary. Additional research is being conducted on species composition, forage quality, and spatial relationships (among legume recruitment/persistence, soil properties, and landscape position), which may explain observed animal performance.

Table 1. Names of legumes interseeded into warm-season pastures.

Common name	Binomial	Life cycle	Cultivar
alfalfa	*Medicago sativa* L.	perennial	Alfagraze
alfalfa	*Medicago sativa* L.	perennial	Travois
berseem clover	*Trifolium alexandrium* L.	annual	Big Bee
birdsfoot trefoil	*Lotus corniculatus* L.	perennial	Norcen
cicer milkvetch	*Astragalus cicer* L.	perennial	Windsor
crimson clover	*Trifolium incarnatum* L.	annual	variety not stated
crownvetch	*Coronilla varia* L.	perennial	Emerald
hairy vetch	*Vicia villosa* Roth	annual	variety not stated
kura clover	*Trifolium ambigum* Bieb	perennial	Rhizo
red clover	*Trifolium pratense* L.	perennial	Mammoth
red clover	*Trifolium pratense* L.	perennial	Redland III
sweetclover	*Melilotus officinalis* (L.) Pall	biennial	Madrid
sweetclover	*Melilotus alba* Medic	biennial	variety not stated
white clover	*Trifolium repens* L.	perennial	Ladino
white clover	*Trifolium repens* L.	perennial	White Dutch

Table 2. Means of cattle gains on various pasture treatments.

Year	Treatment	Total gain (lb)	Average daily gain (lb/day)
1999	Big bluestem	57.50	1.47
	Big bluestem/Legume	60.00	1.54
	Switchgrass	54.29	1.39
	Switchgrass/Legume	51.25	1.31
2000	Big bluestem	90.63	1.68
	Big bluestem/Legume	96.88	1.79
	Switchgrass	89.38	1.66
	Switchgrass/Legume	95.00	1.76
2001	Big bluestem	38.13	0.61
	Big bluestem/Legume	35.63	0.57
	Switchgrass	55.63	0.88
	Switchgrass/Legume	52.50	0.83

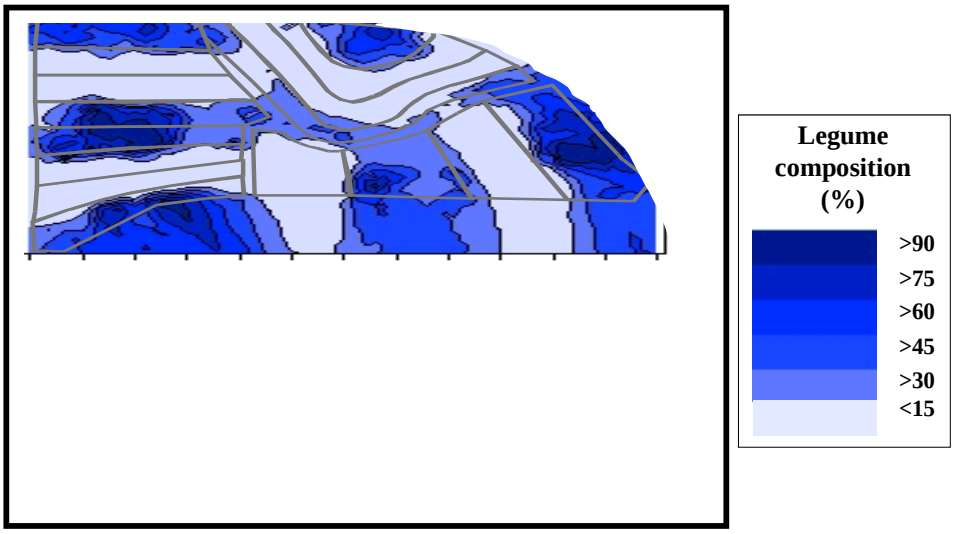

Figure 1. Spatial distribution of mean % legume composition.