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Pasture Improvements with Mixed Composition of Warm-Season Grasses and Legumes

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Abstract
Forage growth is an important part of sustainable livestock production and grazing. Iowa pastures consist mainly of cool-season grasses, and this limits the amount of forage available for livestock production during hot summer months. By establishing warm-season grasses in pastures, the overall efficiency of forage growth is improved for livestock production. Legumes can help provide nitrogen for neighboring grasses in pastures. 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. The overall objective of this research is to improve warm-season pasture productivity for livestock production by establishing a complex mixture of legumes.

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Introduction

Forage growth is an important part of sustainable livestock production and grazing. Iowa pastures consist mainly of cool-season grasses, and this limits the amount of forage available for livestock production during hot summer months. By establishing warm-season grasses in pastures, the overall efficiency of forage growth is improved for livestock production. Legumes can help provide nitrogen for neighboring grasses in pastures. 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. The overall objective of this research is to improve warm-season pasture productivity for livestock production by establishing a complex mixture of legumes.

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, cb. Rountree) pastures in 1998. The legumes planted represent species with varying life cycles and growth habits (Table 1). Grazing was deferred until summer of 1999 to allow the legumes to develop a seed bank, which may provide a more balanced population of legumes with varying characteristics for a longer period of time.

The experimental design is a split plot with half of each pasture consisting of legumes and the other half left in grass. Starting June 13, 2000, pastures were strip-grazed by beef cattle until August 15, 2000. Cattle weights were determined before and after the grazing season. Pasture samples were collected from paddocks to determine the quantity of available forage. Legume establishment and persistence was monitored by counts made at fixed positions within the landscape.

Preliminary Results and Discussion

Mean cattle gains for the big bluestem pastures were higher than either of the warm-season grass/legume mixtures (Table 2). One would expect that the grass/legume mixture would have shown the highest gains. However, some big bluestem pastures did have significant volunteer legumes and cool-season grasses present. This could be a reason for higher cattle gains in the big bluestem pastures. Of the pastures containing legumes, a relatively high percentage of legumes was recorded for each harvest (Figure 1). Harvest 6 for the switchgrass/ legume mixture did show a lower percentage of legumes. This was probably due to sampling error. These results should be regarded as preliminary.

Due to an encroachment of cool-season grass in warm-season pastures, cool-season grass samples will be collected next season from all of the treatments to help understand the difference in cattle gains for warm-season grass pastures. Forage quality of collected samples will be evaluated for *in vitro* dry matter digestibility, total nitrogen concentration, and fiber composition. Data will be analyzed spatially to determine the relationships among soil properties, landscape position, and legume recruitment and persistence.

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	Norceen
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	*Trifolim repens* L.	perennial	White Dutch

Table 2. Means of cattle on various pasture treatments.

Treatment	Total gain	Average daily gain
	(lbs.)	(lbs./day)
Big bluestem	100.71	1.60
Big bluestem/Legume	96.25	1.53
Switchgrass	80.63	1.28
Switchgrass/Legume	95.00	1.51

Figure 1. Percentage of legumes for each harvest collected in pastures consisting of warm-season grass/legume mixture.