AES

Keeping Up With Research

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Interseeding Legumes into Cool-season Grasses[1]

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Interseeding is introducing a legume or a grass into a permanent grass sod with minimum soil disturbance. Reason to interseed is to increase forage production and forage quality of overgrazed or unproductive grasslands. The little sod disturbance greatly reduces risks of soil erosion and moisture loss compared with conventional renovation.

Because permanent pastures are often low in pH and phosphorus, each pasture should be soil tested and needed amounts of lime, phosphorus, and potassium applied before interseeding. Legumes grow best when soil pH is more than 6.5 and adequate phosphorus is available. Lime should be applied several weeks or months before interseeding, but P and K may be broadcast or banded at seeding time. Because it

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stimulates an already competitive grass, nitrogen should not be applied before or after interseeding.

Legumes may be added to permanent pastures by several methods: by conventional renovation, or with tillage equipment like a chisel or disk, to disturb the sod and allow soil-seed contact. Legumes have been added to many pastures in Kansas with a chisel or disk, and excellent red clover stands have been obtained with one heavy disking or 2 chiseling (criss-cross) operations. Seed may be broadcast on the soil surface after the tillage operation or a double disk grain drill easily can be converted to a land seeder. The tillage may be in early spring or late fall, when freezing and thawing will help cover the seed with soil.

At least three no-till, pasture-renovation planters are available to seed legumes, small grains, or even other grasses into grass sod: the John Deere Powr-till seeder, the Midland Zip seeder, and the Tye Pasture Pleaser. Regardless of machine used, seed should be placed 1/4 to 1/2 inch deep in the tilled areas. Interseeding legumes deeper than 1/2 inch usually results in stand failure.

Heavily grazing pastures before seeding allows better soil-seed contact and reduces competition by the grass sod with the emerging legume seedlings. Cattle should be allowed to graze the interseeding after grass starts to grow. Grazing is to reduce competition with the legume; so it should not be intense enough to prevent legume seedlings from developing.

Paraquat, a contact herbicide, may be used to retard grass growth until legumes become established. Since Paraquat is a contact herbicide, it kills only the leaf tissue of perennial grasses when applied at the proper rate.

We initiated research studies to: 1) determine compatible interseeded legume-grass mixtures, 2) determine forage quality of interseeded mixtures, 3) evaluate rates of paraquat, and 4) to evaluate fall and spring interseeding.

Test Procedures

Southeast Kansas Experiment Station/Parsons

We interseeded seven legume species with a Midland Z-6 ZIP seeder into a two-year-old stand of Kentucky-31 tall fescue at the Parsons station April 22, 1976. Legume species evaluated and seeding rates were:

Legume	Pounds per acre
Kanza alfalfa	20
Madrid sweetclover	25
Kenland red clover	12
Dawn birdsfoot trefoil	25
Alsike clover	8
Ladino clover	4
Korean lespedeza	25

April 27, 1976, tall fescue plots in pure stands received appropriate nitrogen applications, and legume-tall fescue plots received 50 pounds of phosphorus and 50 pounds of potassium per acre plus an additional 25 pounds of nitrogen and 75 pounds of phosphorus per acre June 10. Paraquat (3 pints per acre) and X-77 spreader (8 oz./acre) were sprayed on the legume-fescue treatments. February 28, 1977, tall fescue plots in pure stands received recommended nitrogen applications and legume-fescue plots, 50 pounds per acre of phosphorus and 50 lb/A of potassium. Plots were harvested June 8 and August 5, 1976 and May 25, June 29, and September 27, 1977.

Forage quality was evaluated by an *in vitro* digestibility technique and by crude protein content.

East Central Kansas Experiment Field/Ottawa

Kanza alfalfa and Kenland red clover were interseeded into an old bromegrass sod August 11, 1975, with an experimental no-tillage seeder provided by Ortho Division, Chevron Chemical Company. Zero, 1, or 2 pints/acre of Paraquat was applied to each plot at interseeding. Seeding

rates were 15 pounds/acre for the alfalfa and 12 pounds/acre for the red clover. Plots were 5 feet by 30 feet with 3 replications. Plots were harvested twice each year because summer drouth did not allow enough fall growth for a third harvest. Cutting dates were June 3 and July 13, 1976, and May 20 and July 12, 1977. Legume percentages were determined by hand clipping a strip across each plot, hand separating the legume and grass components, and weighing each oven-dried part.

Results

Southeast Kansas Experiment Station/Parsons

Total forage yields, protein content, and forage digestibility are shown in Table 1. Forage yields differed significantly among treatments both years. Total yield in 1976 is the forage harvested from 2 cuts of tall fescue in pure stands (June and August) compared with only one cutting from renovated mixtures (August). The interseeded fescue plots had not recovered enough from the paraquat application to be harvested in June. Tall fescue yields in June ranged from 0.95 to 2.03 tons/acre with 0 and 100 pounds of nitrogen per acre, respectively. As expected, the tall fescue + nitrogen outyielded the interseeded mixtures the year they were interseeded. However, excellent interseeded stands of legumes, and forage yields comparable to the zero N treatment, resulted the year of interseeding. Crude protein contents of red clover-fescue and sweetclover-fescue mixtures were more than 15%, much higher than other mixtures or the tall fescue + N treatments. *In vitro* digestibility tended to be slightly higher for grass-legume combinations than for grass forage.

The fall of 1976 and winter and early spring of

Table 1. Forage yields, in vitro digestibilities, and crude protein contents of indicated forages at Parsons.

Forages	N/A lbs	Total forage yield[1] (Tons/acre at 12% H_2O) 1976	1977	Total	Mean % digest. 1976	1977	Mean crude protein, % 1976	1977
Tall Fescues + Nitrogen								
Tall fescue	0	1.35	1.03	2.38	57.3	55.7	9.3	10.3
Tall fescue	25	1.93	1.45	3.38	54.4	55.8	9.0	10.5
Tall fescue	50	2.49	1.74	4.23	55.1	58.4	9.9	10.1
Tall fescue	100	2.97	2.41	5.38	57.3	53.1	10.6	10.8
Tall Fescue + Legume								
Kanza alfalfa		1.27	3.01	4.28	56.7	58.7	13.4	14.5
Dawn birdsfoot trefoil		1.48	4.01	5.49	60.0	61.6	11.9	14.8
Kenland red clover		1.52	3.20	4.72	56.2	53.8	15.4	15.1
Alsike clover		0.97	2.55	3.52	57.2	54.2	11.6	12.2
Ladino clover		1.29	2.55	3.84	59.1	54.1	10.5	10.3
Madrid sweetclover		1.56	2.79	4.35	59.5	53.0	15.0	10.4
Korean lespedeza		1.29	2.39	3.68	56.1	52.8	10.1	9.6

1. $LSD_{.05} = 0.37$ to compare year means within a treatment.
$LSD_{.05} = 0.41$ to compare treatment means within a year.

1977 were so dry that grass didn't grow enough for a fall harvest. Forage production of tall fescue in pure stands in the spring 1977 increased from 0.42 to 1.32 tons per acre with added amounts of nitrogen, only about 75% as much as in 1976. Total yield in 1977 was composed of harvests in May and September for all treatments except Kanza alfalfa, Dawn birdsfoot trefoil, and Kenland red clover. Those three had regrowth enough for an additional late June harvest. Interseeded mixtures of Kanza alfalfa-fescue, and Kenland red clover-fescue produced more than 3 tons of forage; Dawn birdsfoot trefoil-fescue, 4 tons per acre. The birdsfoot trefoil-fescue mixture was most digestible both years, nearly 3% better than any other mixture or pure fescue stand in 1977.

Crude protein content was higher in 1977, and as expected, the legume-grass combinations were superior to tall fescue alone both years.

East-Central Kansas Experiment Field, Ottawa

Forage yield data, in Table 2 show that red clover-bromegrass yielded nearly twice as much alfalfa-bromegrass in 1976 but only slightly more in 1977. Legume percentages of spring-harvested forages show herbicide treated plots contained more legumes than did control plots. Visual observations indicated that stands of red clover were superior to alfalfa. Very little alfalfa grew in plots where no herbicide was applied. The high percentage of legumes in the summer harvest reflect relatively poor regrowth of the grass. Such an imbalance of legume, would increase the possibility of bloat if summer grazing was on an area cut for hay in the spring.

Table 2. Forage yields of the legume-grass combinations and legume percentages after interseeding red clover and alfalfa into bromegrass at Ottawa.

Legume	Paraquat (Pints/acre)	Forage yield (Tons/acre at 15% H_2O) 1976 Spring	1976 Summer	1976 Total	1977 Spring	1977 Summer	1977 Total
Bromegrass-red clover	0	1.30	0.42	1.72	2.06	1.01	3.07
	1	2.00	1.05	3.05	2.30	1.08	3.38
	2	2.52	1.45	3.97	2.20	1.25	3.45
Bromegrass-alfalfa	0	.96	0.07	1.03	1.86	0.47	2.33
	1	1.06	0.24	1.30	2.42	0.81	3.23
	2	1.27	0.37	1.63	2.37	1.23	3.60
LSD.05		0.26	0.28	——	0.18	0.34	——
		Legume, %					
		1976 Spring	1976 Summer		1977 Spring	1977 Summer	
Bromegrass-red clover	0	5.3	64.3		30.3	79.0	
	1	42.7	78.3		39.7	67.0	
	2	74.5	88.7		45.7	81.0	
Bromegrass-alfalfa	0	0.1	4.3		10.3	37.0	
	1	3.7	43.0		42.3	27.0	
	2	29.7	65.7		25.0	37.0	
LSD.05		8.0	14.4		22.2	44.3	

Summary

These experiments indicate that several legumes can be successfully interseeded into smooth bromegrass or tall fescue sod either in the fall or spring. Red clover, birdsfoot trefoil, and alfalfa are the best species for interseeding in eastern Kansas. Applying a non-selective contact herbicide to the grass prior to seeding resulted in better stands of the legume and higher yields. The yield advantage of the plots treated with the herbicide was greater in the seedling year at Ottawa and in the second yeat at Parsons.

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Mention of a tradename does not constitute an endorsement of that product or machine over others that may be suitable.

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