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SEEDING LEGUMES INTO TALL FESCUE SOD

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Seeding Legumes into Tall Fescue Sod

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TALL FESCUE (*Festuca arundinacea*) is the most widely grown cool season perennial forage grass in Alabama. It is well adapted and produces forage over much of the year. One disadvantage, however, is that animal performance on tall fescue pasture is often poor.

Growing clover or another legume with tall fescue offers a way of improving the quality of forage produced while also supplying nitrogen for the grass. That legumes improve steer daily gain on tall fescue pasture was shown in previous Alabama Agricultural Experiment Station research (*2, 4*). Unfortunately, most of Alabama's 800,000 acres of tall fescue contain no clover. Therefore, adding clover to existing tall fescue sod would be expected to boost beef calf weaning weights and beef production per acre.

Seeding clover into tall fescue has had limited success because strong competition by the grass makes it difficult to establish clover in the sod. Weakening the sod by close grazing and tillage prior to seeding the clover is recommended but leaves the sod in poor condition. Application of herbicides to injure or kill a portion of the fescue stand has resulted in

[1]Respectively, Professor, Research Associate, and Research Associate, Department of Agronomy and Soils; Superintendent and Assistant Superintendent, Tennessee Valley Substation; Superintendent and Associate Superintendent, Sand Mountain Substation; Superintendent and Associate Superintendent, Piedmont Substation; and Superintendent and Associate Superintendent, Black Belt Substation.

successful establishment of clover in states to the north of Alabama *(5)*. Applying the chemical in narrow strips reduces grass competition and aids establishment of small clover seedlings.

Another serious problem in obtaining clover stands in tall fescue sod is the striped field cricket *(Nemobius fasciatus)*. This insect pest is often abundant in autumn and destroys small seedlings *(1, 3)*.

This publication summarizes results of experiments with sod-seeding of legumes in tall fescue over a 5-year period at four locations in Alabama.

EXPERIMENTAL PROCEDURE

In 24 field trials, perennial legume species, planting dates, seeding methods, and growth suppressant chemicals were studied.

Regal ladino clover *(Trifolium repens)*, Redland red clover

FIG. 1. Results of spraying Paraquat in bands to suppress tall fescue competition to clover seedlings.

(Trifolium pratense), Fergus birdsfoot trefoil *(Lotus corniculatus)*, and Apollo alfalfa *(Medicago sativa)* were used. Lime, phosphorus, and potassium were applied according to soil test recommendations. Seeding was done in autumn and also in late winter on established stands of Kentucky 31 tall fescue at the Tennessee Valley, Sand Mountain, Piedmont, and Black Belt substations.

The sod was closely clipped and various seeding methods and sod treatments were used. Both broadcast and row plantings were made using a Tye Pasture Pleaser, Zip Seeder, and two experimental drills. Sod treatment included rototilling and application of chemical growth suppressants, Roundup®[2] and Paraquat®[2]. The chemicals were applied in 5-inch bands 10 inches apart at a rate of ½ pound per sprayed acre. Results are shown in figure 1. Roundup is not yet labeled for this use.

Regal ladino clover was planted at the rate of 3 pounds of seed per acre, Redland red clover at 6 pounds per acre, Fergus birdsfoot trefoil at 3 pounds per acre, and Apollo alfalfa at 10 pounds per acre. No nitrogen fertilizer was applied. Diazinon®[3] was applied to control striped field cricket. Plots were 6 x 25 feet with four replications. Forage was harvested when growth accumulated, and the percent legume was established for each plot at each harvest.

RESULTS

Dependability of Sod-seeding Legumes in Tall Fescue Sod

Success of stand establishment efforts was greatest in northern Alabama and poorest at the Black Belt Substation in central Alabama, table 1. Insects, mainly striped field crickets, were the most important cause of failure. Crickets, and sometimes grasshoppers, often destroyed clover seedlings soon after emergence. Insect control was difficult on small plots because damaging populations of the insects moved into the plot area from surrounding, noninsecticide-treated areas. This problem is much less severe on pastures where large areas are

[2]Roundup (common name, glyphosate) is a product of Monsanto Chemical Co., and Paraquat is a product of Chevron Chemical Co.

[3]Diazinon is a product of Ciba-Geigy Corporation.

TABLE 1. SUCCESS OF SEEDING LEGUMES INTO TALL FESCUE SOD AT FOUR LOCATIONS IN ALABAMA OVER A 5-YEAR PERIOD, 1975-79

Location	Month seeded	Number of trials	Number of successful trials	Reason for failure
Tennessee Valley Substation	Sept.	5	2	Insects
Tennessee Valley Substation	Mar.	3	3	—
Sand Mountain Substation	Sept.	5	4	Insects
Sand Mountain Substation	Late Oct.	1	0	Winterkilled
Piedmont Substation	Sept.	4	2	Insects
Black Belt Substation	Sept.	4	1	Insects
Black Belt Substation	Mar.	2	1	Drought
TOTAL		24	13	

treated with insecticide. Drought also contributed to failure, especially at the Black Belt Substation.

Legume Species

Red clover was generally the most productive legume during the establishment year, a result of larger seedlings and more rapid establishment. At the Sand Mountain Substation, red clover produced the most forage the first year, but in succeeding years birdsfoot trefoil equalled or exceeded it, table 2. Drought the first year and extreme drought the third year sharply reduced production; however, stands of trefoil remained good.

At the Tennessee Valley Substation, red clover was more productive than ladino clover the first year, table 3. Alfalfa and birdsfoot trefoil stands were failures at this location and at the Piedmont Substation.

Date of Seeding

Autumn establishment of clovers is desirable because spring forage production is greater than from late winter planting. However, the hazards of seedling loss from insects and drought in autumn may make late winter planting more desirable in northern Alabama. At the Tennessee Valley Substation, clover establishment and forage production have often been superior and more dependable from late winter planting, table 4. Results at the Sand Mountain Substation indicate that September planting is necessary for fall establishment to be successful in northern Alabama, table 1. Plantings made in late October and November suffered winter kill of seedlings. In

TABLE 2. FORAGE YIELD OF KENTUCKY 31 TALL FESCUE SOD-SEEDED SEPTEMBER 9, 1977, WITH THREE LEGUMES, SAND MOUNTAIN SUBSTATION, CROSSVILLE, ALABAMA, OVER A 3-YEAR PERIOD

Legume species	Yield of oven dry forage per acre								
	1978			1979			1980		
	Legume	Grass	Total	Legume	Grass	Total	Legume	Grass	Total
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Redland red clover	1,720 a[1]	1,110 a	2,830 a	2,970 a	1,630 c	4,600 b	400 b	1,200 a	1,600 a
Fergus trefoil	1,080 b	1,150 a	2,230 b	2,830 a	2,690 a	5,520 a	780 a	1,390 a	2,170 a
Regal ladino clover	750 b	1,200 a	1,950 b	1,100 b	2,000 b	3,100 c	130 c	870 b	1,000 b
None	0 c	1,230 a	1,230 c	0 c	1,840 bc	1,840 d	0 c	750 b	750 b

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

TABLE 3. FORAGE YIELD OF KENTUCKY 31 TALL FESCUE WITH CLOVER SOD-SEEDED AND BROADCAST, SEPTEMBER 26, 1979, AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA

Clover	Method of seeding	Yield of oven dry forage per acre		
		Clover	Grass	Total
		Lb.	*Lb.*	*Lb.*
Redland red	Rows	1,360 a[1]	2,080 a	3,440 a
Redland red	Broadcast	1,260 a	1,740 a	3,000 a
Regal ladino	Rows	220 c	2,270 a	2,490 ab
Regal ladino	Broadcast	990 b	1,730 a	2,720 a
None	—	0 c	2,160 a	2,160 b

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

TABLE 4. FORAGE YIELD OF KENTUCKY 31 TALL FESCUE SOD-SEEDED WITH CLOVERS AT TWO DATES AT TENNESSEE VALLEY SUBSTATION, BELLE MINA, ALABAMA

Clover species	1980 yield of oven dry forage per acre					
	Planted March 13, 1979			Planted September 25, 1979		
	Clover	Grass	Total	Clover	Grass	Total
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Redland red	3,380 a[1]	2,550 c	5,930 a	670 a	2,480 a	3,150 a
Regal ladino	1,140 b	3,350 b	4,490 b	400 a	2,480 a	2,880 a
None	0 c	3,790 a	3,790 b	0 b	2,640 a	2,640 a

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

contrast, late winter planting at the Black Belt Substation has had only limited success because of spring and summer drought.

Method of Seeding

Row seeding of clovers in sod did not give any consistent advantage over broadcast seeding, tables 3, 5, 6, 7, and 8. Although row seeding establishment was superior in some cases at the Piedmont Substation, the reverse was true for ladino clover at the Tennessee Valley Substation where the seed were planted too deep in the drill row. Broadcast planting of small seeded clover, such as ladino, alleviates this problem although some seed may be wasted in grass sod strips not treated with the growth suppressant chemical (herbicide).

Growth Suppressant Chemicals

The most critical factor in obtaining clover stands appears to be application of a herbicide to curtail growth of the tall fescue. Paraquat gave rapid top kill of the sod, whereas Roundup

TABLE 5. TWO-YEAR FORAGE YIELD OF KENTUCKY 31 TALL FESCUE WITH REGAL LADINO CLOVER SOD-SEEDED AND BROADCAST, SEPTEMBER 9, 1977, WITH AND WITHOUT CHEMICAL GROWTH SUPPRESSANTS, SAND MOUNTAIN SUBSTATION, CROSSVILLE, ALABAMA

Sod treatment	Clover seeding method	Yield of oven dry forage per acre					
		1978			1979		
		Clover	Grass	Total	Clover	Grass	Total
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Roundup	Rows	490 c[1]	860 b	1,350 bc	1,040 b	1,960 a	3,000 a
Roundup	Broadcast	1,120 b	920 ab	2,040 b	1,020 b	2,050 a	3,070 a
Paraquat	Rows	640 c	810 b	1,450 bc	1,540 a	2,020 a	3,560 a
Paraquat	Broadcast	1,240 b	840 b	2,080 b	1,180 b	2,120 a	3,300 a
None	Rows	120 d	1,140 a	1,260 bc	1,310 ab	2,060 a	3,370 a
None	Broadcast	580 c	960 ab	1,540 bc	1,150 b	2,320 a	3,470 a
Tilled	Broadcast	3,330 a	680 c	4,010 a	640 c	1,230 b	1,870 b
None	None	0 d	1,070 a	1,070 c	0 d	1,930 a	1,930 b

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

TABLE 6. TWO-YEAR FORAGE YIELD OF KENTUCKY 31 TALL FESCUE WITH REGAL LADINO CLOVER SOD-SEEDED AND BROADCAST, SEPTEMBER 11, 1975, WITH AND WITHOUT GROWTH SUPPRESSANT CHEMICALS, PIEDMONT SUBSTATION, CAMP HILL, ALABAMA

Sod treatment	Clover seeding method	Yield of oven dry forage per acre					
		1976			1977		
		Clover	Grass	Total	Clover	Grass	Total
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Roundup	Rows	3,560 a[1]	3,260 c	6,820 a	2,800 a	3,420 ab	6,220 a
Roundup	Broadcast	1,500 d	4,970 b	6,470 ab	1,950 b	3,100 b	5,050 b
Paraquat	Rows	2,640 bc	3,600 c	6,240 b	3,090 a	3,570 ab	6,660 a
Paraquat	Broadcast	2,000 cd	4,030 c	6,030 b	3,030 a	3,530 ab	6,560 a
None	Rows	1,420 d	5,030 b	6,450 ab	2,000 b	3,080 ab	5,080 b
None	Broadcast	260 e	5,770 a	6,030 b	1,060 c	4,350 a	5,410 b
None	None	0 e	4,110 c	4,110 c	0 d	3,430 b	3,430 c

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

TABLE 7. FORAGE YIELD OF KENTUCKY 31 TALL FESCUE WITH REGAL LADINO CLOVER SOD-SEEDED OR BROADCAST SEPTEMBER 12, 1975, WITH AND WITHOUT GROWTH SUPPRESSANT CHEMICALS, BLACK BELT SUBSTATION, MARION JUNCTION, ALABAMA, DURING 1976

Sod treatment	Clover seeding method	1976 yield of oven dry forage per acre		
		Clover	Grass	Total
		Lb.	*Lb.*	*Lb.*
Rototilled	Broadcast	4,760 a[1]	1,440 c	6,200 a
Roundup	Rows	1,450 b	2,840 a	4,290 b
Roundup	Broadcast	1,930 b	2,210 b	4,140 b
Paraquat	Rows	1,650 b	2,190 b	3,840 bc
Paraquat	Broadcast	1,720 b	2,250 b	3,970 bc
None	Rows	570 c	2,980 a	3,550 bc
None	Broadcast	600 c	3,100 a	3,700 bc
None	None	90 d	3,140 a	3,230 c

[1]Means within a column having the same letter are not significantly different at the 5 percent level.

TABLE 8. FORAGE YIELD OF KENTUCKY 31 TALL FESCUE SOD-SEEDED MARCH 10, 1979, WITH RED AND LADINO CLOVERS AT BLACK BELT SUBSTATION, MARION JUNCTION, ALABAMA, DURING 1980

Clover	Sod treatment	Seeding method	1980 yield of oven dry forage per acre		
			Clover	Grass	Total
			Lb.	*Lb.*	*Lb.*
Redland red	Paraquat	Broadcast	670 a[1]	700 a	1,370 a
Redland red	Tilled	Broadcast	640 a	700 a	1,340 a
Redland red	Paraquat	Rows	440 ab	590 ab	1,030 ab
Redland red	None	Rows	160 cd	500 b	660 b
Regal ladino	Paraquat	Broadcast	270 b	780 a	1,050 ab
Regal ladino	Tilled	Broadcast	50 c	760 a	810 b
Regal ladino	Paraquat	Rows	160 c	650 ab	810 b
Regal ladino	None	Rows	120 c	820 a	940 b
None	None	None	0 d	620 ab	620 b

[1]Means within a column marked with the same letter are not significantly different at the 5 percent level.

gave slower but longer lasting kill. At the Black Belt Substation, dallisgrass *(Paspalum dilatatum)* in the tall fescue sod was unaffected by Paraquat but killed by Roundup. Clover seedling growth was concentrated in strips of grass sod suppressed by the chemical, figure 2.

Paraquat and Roundup improved clover establishment and subsequent production 50 to 100 percent, tables 5, 6, 7, and 8. The substantial increase in clover production was mainly a result of reducing competition from the grass sod, figure 3. Although total forage yield may not be increased by establishment with a growth suppressant chemical, the percentage clover in the forage is increased, thus enhancing the nutritive

FIG. 2. Clover seedlings concentrated in strips of grass sod suppressed by the herbicide.

quality for livestock. Even a small increase in legume content of the forage can sharply increase animal performance on tall fescue pasture *(4)*.

In favorable seasons, when rainfall was adequate and insects were not a serious problem, method of seeding had little effect on clover yield. In two trials at the Tennessee Valley Substation, clover establishment and growth were excellent on all seeded plots, regardless of seeding method or chemical treatment. It would appear that use of the chemical growth suppressant is most beneficial in stress situations, such as are generally common in tall fescue pastures during autumn.

FIG. 3. Use of a herbicide to suppress tall fescue sod resulted in good establishment of ladino clover (left) at the Piedmont Substation. Plot at right was also seeded with clover but not treated with the chemical.

SUMMARY AND CONCLUSIONS

1. Experiments were conducted at four Alabama locations over a 5-year period to study the effect of legume species, seeding date, seeding method, and growth suppressant chemicals on establishment and forage production of legumes in tall fescue sod.

2. Striped field crickets appeared to be a major cause of clover stand failure in autumn seedings.

3. Sod-seeding was not dependable; it gave best results in northern Alabama and poorest in the central part of the State.

4. Red clover was generally more productive than ladino clover during the establishment year. Birdsfoot trefoil showed promise at the Sand Mountain Substation.

5. Late winter seeding appeared to be more dependable than autumn seeding in northern Alabama.

6. Broadcast seeding was nearly as good as row seeding.

7. The use of a herbicide as a growth suppressant was important in reducing tall fescue competition and aiding legume establishment and growth. Paraquat is labeled for use but Roundup is not yet cleared for this use.

8. Successful legume establishment can substantially increase forage production and improve nutritive quality of tall fescue pasture.

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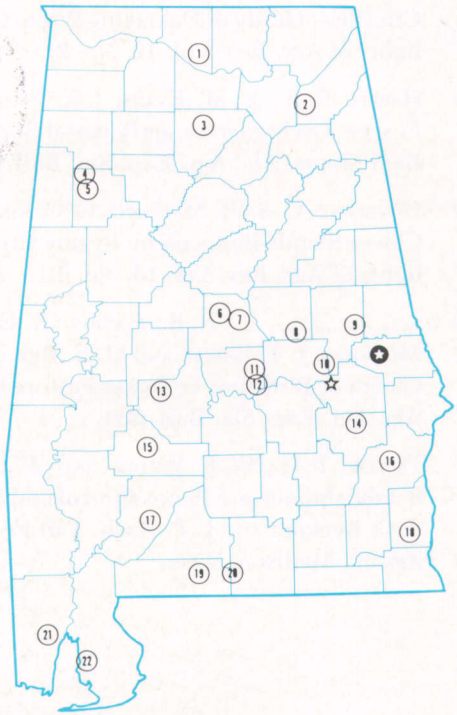

Research Unit Identification

✪ Main Agricultural Experiment Station, Auburn.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. The Turnipseed-Ikenberry Place, Union Springs.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Solon Dixon Forestry Education Center, Covington and Escambia counties.
21. Ornamental Horticulture Field Station, Spring Hill.
22. Gulf Coast Substation, Fairhope.