FLORAKIRK BERMUDAGRASS

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IMPORTANT CHARACTERISTICS

Florakirk bermudagrass (*Cynodon dactylon*) is a fine-stemmed, persistent, cold tolerant, high yielding, good quality bermudagrass released for hay production by the University of Florida. The grass is most adapted to the panhandle and northern part of peninsular Florida, but also will persist well on the colder sites of central Florida.

Advantages

1. Persistent, with good forage quality. Digestibility of Florakirk is about 6 to 7 percentage units greater than Coastal (*C. dactylon*) and Alicia (*C. dactylon var. elegans*).

2. Florakirk will produce good yields on central Florida wet, flatwood soils north into southern Georgia.

3. Cold tolerant to 8 F at Jay, FL.

4. With adequate fertility will produce more forage during the cool season (January-February) than most bermudagrasses in central Florida.

5. Fine stem grass which can make excellent hay that cures rapidly during favorable weather conditions.

6. Good drought tolerance.

7. Grass appears unaffected by the two- line spittle bug (*Prosapia bicincla*).

8. Nutritious when harvested or grazed every 4 to 5 wk.

9. Eight year average dry yield at Gainesville was 6.9 tons/acre or 10% higher than Coastal. Six year study at Jay revealed Florakirk out yielded Tifton 44 and Tifton 78 (*C. dactylon*) by nearly 2 to 1.

10. Leaf diseases have not limited forage production when harvested for hay.

Disadvantages

1. Vegetatively propagated from stem cuttings.

2. Requires higher fertility than limpograss (*Hemarthria alissima*), digitgrass (*Digitaria decumbens)*, and bahiagrass (*Paspalum notatum*) for best results.

3. Forage quality drops rapidly after 6-7 wk of growth and following a heavy frost.

4. Top growth easily killed by frost.

5. Can have some rust (*Puccina* sp.), leaf spot (*Helminthosporum* sp.) and tar spot (*Phyllachora* sp.) disease especially when harvest is delayed beyond 5 wk.

6. High HCN-p for about a 4-wk period following heavy N fertilization (100 lb/acre).

7. Susceptible to army worms (*Spodoptera frugiperda*) and striped grass loopers (*Mocis latipes*), like other *Cynodon* and *Digitaria* grasses.

INTRODUCTION

'Florakirk' bermudagrass (*Cynodon dactylon*) is a persistent, perennial grass that is well adapted to the panhandle and the northern part of peninsula Florida. It also grows well on south Florida flatwoods that are too cold for stargrasses. The primary use of this grass is to fill the need for a persistent, high yielding, high quality, fine-stemmed forage which can be used for hay production in north and

northwest Florida and colder areas of central Florida. When vegetatively planted on a clean seed bed free of common bermudagrass (CB) (*Cynodon dactylon*), Florakirk spreads rapidly. When adequate moisture and fertility are available, along with good weed control, a dense stand of grass 24 in high can be obtained in 75 days or less. Florakirk, like most bermudagrasses and stargrasses, has a high fertility requirement; therefore, an intensive grazing or harvest system must be practiced to obtain maximum yield and utilization of forage. Dry matter (DM) production of Florakirk has been good in central Florida and in Gainesville where yields averaged 10% higher than for Coastal over a 10-yr period. When adequate fertility is available, this grass tends to produce good late season yields and initiates rapid spring regrowth even under drought conditions. When compared with Coastal in Gainesville, both grasses showed similar spring regrowth; however, late fall (October-November) yields favored Florakirk by 24%. Like most bermudagrasses, Florakirk matures rapidly; therefore, grazing frequency (rest period between grazings) and regrowth interval for hay production should not extend beyond 5 wks. Crude protein (CP) at this grazing frequency averaged 8 to 9% at Ona which is similar to other bermudagrass and stargrass cultivars. In vitro organic matter digestion (IVOMD) ranged from 53% (Gainesville, 1980) to 61% (Gainesville, 1989), which was 7 to 8 percentage units higher than for Coastal bermudagrass, about equal to Florona stargrass (***C***. *nlemfuensis* Vanderyst var. *nlemfuesis*), and 3 percentage units lower than Florico stargrass at Ona. Animal live weight gains from this grass, which have ranged from 350 to 450 lb/acre, are similar to those obtained from 'Brazos' bermudagrass (*C*. *dactylon*), but lower than those obtained on stargrass in central Florida. Florakirk bermudagrass carries a high hydrocyanic acid potential (HCN-p), especially when high levels of nitrogen are applied. However, no detrimental effects on grazing cattle at Ona have been attributed to HCN-p in this grass. Insect problems appear to be limited to fall armyworms and striped grass loopers. A foliar blight (*Rhizoctonia solani*) was observed on this grass twice within an 11-yr period. Leaf spot and rust have been observed, especially when plants were allowed to mature 3 to 4 wks beyond the desirable cutting stage. Tar spot on leaves, caused by *Phyllachora* sp., has caused leaf browning at the Range Cattle Research and Education Center (REC) when Florakirk was allowed to go ungrazed or uncut for long periods of time.

No apparent Florakirk damage has been observed or associated with species of plant parasitic nematodes within the genera *Helicotylenchus*, *Hoplolaimus*, or *Pratylenchus*, based on a limited survey of 10 fields at the Range Cattle REC.

Because of its cold tolerance and persistence, Florakirk has been selected for release primarily for north Florida and southern Georgia. Forage yield and quality are equal to or better than most available forages presently grown in this region. Florakirk appears to have good forage production during the cool-dry spring season in central and south Florida, provided that adequate fertility is available. Florakirk is a viable option for cattle and horse owners who desire a high quality,

fine-stem grass for hay.

ORIGIN

Florakirk bermudagrass was developed by Dr. G. W. Burton, USDA-ARS and Georgia Coastal Plain Experiment Station, Tifton, Ga. In 1975 'Callie' bermudagrass (*C. dactylon var. aridus*) was hybridized with Tifton 44 bermudagrass to create F_1 hybrids with greater cold tolerance and rust resistance than Callie. Twenty of these hybrids were established in the field at Tifton, Ga in 1977. In 1979 one of the promising hybrids, 'Tifton 35-3' (later called 'Callie hybrid 35-3'), was sent to Dr. O. C. Ruelke, Gainesville, FL, who sent some vegetative material to the Range Cattle REC. In 1980 a "mob grazing" experiment was established at the Range Cattle REC consisting of Callie hybrid 35-3 and other Cynodon entries (Mislevy et al. 1988). This 3-year study revealed Callie hybrid 35-3, now called Florakirk, had high dry matter yields when grazed at a 4 to 5 wk frequency, good forage quality, excellent persistence, and good drought and cold tolerance. In 1984, pastures were established via sprigging to study grazing management and animal performance. Many of these pastures are still persisting quite well after 10 yr.

DESCRIPTION

Florakirk bermudagrass is a long-lived, stoloniferous, and rhizomatous perennial and a member of the genus *Cynodon.* Stems are much branched and leafy, 0.5 to 2.4 mm in diameter, and reach heights of 15 to 25 in (38 to 64 cm). The nodes and internodes are glabrous (no hairs). Leaf sheaths are loose, overlapping, and glabrous. Ligules consist of a membrane 0.15 to 0.5 mm long, with fringed hairs 0.1 to 0.4 mm long. The junctions of blade and sheath are often reddish and are provided with stiff hairs 1.0 to 4.5 mm long. Leaf blades are 1.0 to 10.0 in (2.5 to 25 cm) long, 1.4 to 5.5 mm wide, flat, soft, and succulent; they possess scattered hairs above and usually are glabrous beneath. The leaf margins are minutely serrulate and contain a few hairs. The inflorescence is composed of 3 to 6 (occasionally 8) purplish-red (or sometimes green with a slight purple tinge) spike-like branches; these are 1.7 to 3.5 in (4.2 to 8.8 cm) long and are arranged in a whorl at the apex of the stem. Spikelets are borne in 2 rows on 1 side of each spike-like branch and are 2.2 to 3.3 mm long; each spikelet possessing a single floret. Glumes are slightly unequal, narrowly ovate, curved, 1-nerved, and 1.0 to 3.3 mm long; they are glabrous except for minute hairs along the keel. The fertile lemma is firm, laterally compressed, 3-nerved, 2.1 to 3.1 mm long, and glabrous except for conspicuous silky hairs on the keel and lateral nerves; the palea is narrow, 2-nerved, slightly shorter than the lemma, and glabrous. Few if any seeds are produced, and propagation is entirely vegetative. It is difficult to differentiate Florakirk from other bermudagrasses, especially 'Tifton 78' and 'Coastcross 1'. Therefore, to be certain of its identity, planting sprigs must be

obtained from a known source.

RESEARCH

Forage Development, Yield, and Quality

Jay Research and Education Center

Florakirk bermudagrass was established on a Red Bay sandy loam (Rhodic Paleudult) soil in 1986 along with Tifton 78 and Tifton 44 bermudagrasses, which were used as standards. The experiment received 290 lb/acre N annually in a 2-1-1 ratio with P_2O_5 and K_2O. Plants were harvested on a 4-wk cycle during the warm season over a 6-yr period, for a total of five harvests /yr., except in 1988 when only four harvests were made. Dry matter yields were higher for Florakirk during all 6 yr when compared with Tifton 78 and Tifton 44 (Table 1). On December 23, 24, and 25, 1989, a hard freeze occurred when temperatures dropped to 9, 8, and 9 F, respectively. Florakirk demonstrated good cold tolerance, yielding 5.2 tons/acre DM in 1990 compared with 0.6 and 2.6 tons/acre DM for the standard cultivars of Tifton 78 and Tifton 44, respectively. Both standard cultivars died after 5 yr of harvesting, but Florakirk produced 3.2 tons/acre DM. Average DM yields for Florakirk over the 6-yr period was 5.7 tons/acre compared with 3.2 (Tifton 78) and 2.8 tons/acre (Tifton 44).

Table 1. Dry matter yield (tons/acre) of three bermudagrass entries grown over a 6-yr period at the Jay, REC.

	Year						
Grass entry	1987	1988	1989	1990	1991	1992	Average
Florakirk	8.7	6.6	6.7	5.2	3.6	3.2	5.7
Tifton 78	7.4	6.2	4.5	0.6	0.3	0.0	3.2
Tifton 44	4.8	4.7	4.2	2.6	0.7	0.0	2.8

North Florida REC, Quincy

In August 1986 Florakirk bermudagrass was established at the North Florida REC, Quincy and compared with standard cultivars grown by producers in the panhandle area of Florida. Florakirk established rapidly, occupying 65% ground cover (GC) 60 days after establishment (Table 2). In June of the following year Florakirk averaged 97% GC, which was 60 percentage units higher GC than Coastal (37%).

Forage production from Florakirk over a 3-yr period averaged 6.5 tons/acre DM (Table 3), which was similar to DM yields for Alicia (6.8 tons/acre), Coastal (6.4 tons/acre), and Tifton 78 (6.1 tons/acre). Although Alicia produced slightly higher DM yields than did Florakirk,it is generally not recommended by IFAS because its forage quality is lower than that of most recommended bermudagrasses. Florakirk and other bermudagrasses had good cold tolerance, especially following the 12 F temperature experienced on December 24, 1989. The following year (1990) all grasses showed excellent DM yield, as further evidence of good cold tolerance.

Table 2. Development (%Ground cover) of seven bermudagrass entries established August 1986 at the North Florida REC, Quincy.

Grass entry	Oct., 1986	June, 1987	Oct., 1987
Florakirk	65	97	100
Coastal	6	37	72
Tifton -78	Trace	25	50
Tifton-44	Trace	27	62
Alicia	40	85	97
Callie	10	92	100
Grazer	15	67	100

Table 3. Dry matter yield (tons/acre) of selected bermudagrasses at the North Florida REC, Quincy.

Grass cultivar	Year			
	1989	1990	1992	3-yr avg
Florakirk	5.5	6.7	7.4	6.5

Coastal	5.6	6.9	6.9	6.4
Tifton 78	4.8	6.7	6.8	6.1
Tifton 44	4.3	5.1	6.9	5.4
Callie	3.6	6.4	7.0	5.6
Alicia	5.4	7.3	7.8	6.8
Grazer	3.5	3.8	5.5	4.2
Notes: Harvested every 4-5 wks from May-October. Fertilization program: 50-60-60 lbs/acre N-P2O5-K2) March; 50 lbs/acre N following harvests in May, June, July, and August; 60 lbs/acre K2O in July.				

Florida Agricultural Experiment Station, Gainesville

Florakirk (compared with Coastal, Coastcross 1, Tifton 44, and Tifton 78 bermudagrass and Pensacola bahiagrass [*Paspalum notatum*] as standards) was established during the summer of 1977 on an Arredondo loamy fine sand (loamy, siliceous, hyperthermic Grossarenic Paleudult) in Gainesville. All grasses were fertilized prior to the growth of each harvest with 60-18-35 lb/acre N-P_2O_5 - K_2O fertilizer containing 20 lb/ton of F 503 (contains the following elemental content: Fe, 18%; Zn, 7.0%; Mn, 7.5%; Cu, 3.0%; and B, 3.0%). Plants were harvested at 4 to 5 wk intervals during the warm season. Florakirk averaged 6.9 tons/acre DM, which was 8 and 10% higher than Tifton 44 and Coastal bermudagrasses, respectively, when averaged over 8 yr (Table 4). In vitro organic matter digestion for Florakirk during the 1980 season was 53%. This value was 2 percentage units lower than Coastcross I (55%) but 4 and 7 percentage units higher than Tifton 44 (49%) and Coastal bermudagrasses (46%), respectively.

In 1987 many of the grasses were reestablished on a new experimental site with the addition of Tifton 78 bermudagrass (Table 4). Results of this 2-yr study revealed Florakirk (6.5 tons/acre) out-yielded Coastal (6.0 tons/acre) by 8% and Tifton 78 (4.9 tons/acre) by 33%. Crude protein and IVOMD were determined on forage harvested only in 1989. Generally, CP was similar for all grass entries.

Results from IVOMD analyses revealed Florakirk and Coastcross I both averaged 61%. These values were 4, 5, and 8 percentage units higher than for Tifton 78, Tifton 44, and Coastal bermudagrasses, respectively.

Table 4. Dry matter (DM) yield (tons/acre DM) of commercial grasses grown in Gainesville over an 8-yr period (1978-1985) and a 2-yr period (1988-1989) along with crude protein (CP;%) and in vitro organic matter digestion (IVOMD;%) for selected years.

Grass cultivar	Year										Year				
									8-yr(t) avg	1980			2-yr(tt) Avg		1989
	1978	1979	1980	1981	1982	1983	1984	1985		IVOMD	1988	1989		CP	IVOMD
Florakirk bermudagrass(c)	9.5	8.0	6.8	7.4	5.2	6.4	6.0	6.1	6.9	53	5.7	7.3	6.5	11.6	61
Coastal bermudagrass	7.9	7.7	7.2	6.9	4.9	6.1	4.9	4.8	6.3	46	5.1	6.8	6.0	11.4	53
Coastcross 1 bermudagrass	7.0	6.7	4.7	6.3	3.7	4.9	4.7	4.2	5.3	55	5.6	5.9	5.8	12.0	61
Tifton 44 bermudagrass	7.3	8.3	7.7	7.5	5.0	5.5	4.8	4.9	6.4	49	3.5	5.7	4.6	11.7	56
Tifton 78 bermudagrass											4.1	5.7	4.9	11.5	57
Pensacola bahiagrass	4.8	6.0	5.6	5.2	4.5	5.9	3.3	3.3	4.8	37					

(t) Study established in 1977.

(tt) Study established in 1987.

(c) Five to six harvests were made during the warm season each year; 60 lb/acre N was applied prior to the growth of each harvest from a 17-5-10 (N-P_2O_5-K_2O) fertilizer containing 20 lb/ton F 503(R).

1 F 503(R) contains the following elemental content: iron, 18%; zinc, 7.0%; manganese, 7.5%; copper, 3.0%; and boron, 3.0%.

Southwest Florida REC, Immokalee

Plot studies comparing 'Florico', 'Florona', and 'Ona' stargrasses (*C. nlemfuensis*), Florakirk and Tifton 78 bermudagrasses, 'Taiwan' digitgrass (*Digitaria pentzii*), and 'Floralta' limpograss at the Southwest Florida Research and Education Center (SFREC), Immokalee, revealed Florakirk was among the lowest forage yielders (Kalmbacher et al., 1989). Dry matter yield for Florakirk averaged 1.8 tons/acre/year over a 3-yr period. These yields were only 50 and 55% of the best yielding grasses: Taiwan digitgrass (3.7 tons/acre) and Floralta limpograss (3.3 tons/acre). Yields were quite low even though the fertility program was 48-24-24 lb/acre N-P_2O_5-K_2O, prior to the first and following each subsequent harvest. The weed CB appeared to be a major problem in Florakirk at this location, occupying 42% of the plot area 2 yr after establishment.

Crude protein and IVOMD were determined on all forage entries sampled at 4-wk intervals. Percentage CP for Florakirk averaged 9.1 over seven harvests, which was equal to or slightly higher than the other cultivars tested. In vitro organic matter digestion for Florakirk averaged 52.2% over seven harvests, which was equal to or greater than that of Florico and Florona stargrasses, Taiwan digitgrass, and Floralta limpograss.

Range Cattle REC

Mob-grazing

In 1980 Florakirk, 4 other bermudagrasses, and two stargrasses, were established in a mob-grazed experiment to study the effect of cattle on DM yield, forage quality, and persistence of these grasses (Mislevy et al., 1988). Each grass was grazed at a 2-, 4-, 5-, and 7-wk frequencies from May to December over a 3-yr period. Grasses received a total annual application of 140-53-106 lb/acre N-P_2O_5-K_2O. The N was applied in four equal applications from March to October, while P_2O_5 and K_2O were applied once annually in March. Dry matter yield of Florakirk increased (5.5 to 7.6 tons/acre/year) as grazing frequency was delayed from 2 to 7 wk (Table 5). Average annual DM yield across grazing frequencies was 7.0 tons/acre for Florakirk, which was similar to Florico stargrass (6.9 tons/acre).

One of the most important factors when selecting a new perennial grass is persistence. Common bermudagrass is a very serious weed problem. Therefore, as CB ground cover increases, the desirable grass decreases. Data in Table 6 indicate that CB ground cover found in Florakirk ranged from 1 to 2% after 3 yr of grazing, regardless of grazing frequency. This would indicate Florakirk is very persistent at Ona and competes well with CB if Florakirk ground cover is nearly 100% at establishment.

Crude protein concentration and IVOMD for Florakirk bermudagrass declined as grazing frequency was delayed from 2 wk (11.7% CP and 58.5% IVOMD) to 7 wk (7.7% CP and 51.3% IVOMD) for May-June harvested forage (Table 7). The CP concentration of Florakirk at Ona was about equal to most bermudagrass and stargrass entries. However, the IVOMD of Florakirk was slightly lower than the highest digestible grasses like Tifton 68 bermudagrass and Florico stargrass, but was generally higher in digestibility than Tifton 44, Coastal (Table 4), or Alicia bermudagrasses.

Table 5. Dry matter yield (tons/acre) of bermudagrasses and stargrasses grazed at various frequencies, Ona, 1982-83.

Grass entries		Grazing frequency (wk)				
		2	4	5	7	2-yr Avg.
Bermudagrass						
	Florakirk	5.5(a)*	7.5(a)	7.5(a)	7.6 (b)	7.0
	Tifton 44	2.5 (c)	5.2(b)(c)	4.0 (b)	5.1 (c)(d)	4.2
	Tifton 72-81	3.3(b)(c)	6.6(a)(b)	7.8(a)	8.4(a)(b)	6.5
	Grazer	2.4(c)	3.1(d)	3.6 (b)	4.6 (d)	3.4
	Tifton 68	3.0(b)(c)	4.6(c)(d)	7.1 (a)	7.3 (b)	5.5
Stargrass						
	Florico	5.0(a)	5.9(a)(c)	7.4(a)	9.3(a)	6.9
	Ona	4.6(a)	4.6(c)(d)	6.4(a)	6.8(c)	5.6

* Means within a column followed by different letters are different ($P<0.05$) according to Duncan's Multiple Range Test.

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Table 6. Invasion (% ground cover) by common bermudagrass (CB) *(Cynodon daclylon)* in stands of improved bermudagrass and stargrass cultivars after 3 yr of grazing, at four frequencies, Ona, 1981 -1983.

Grass entries			Grazing frequency (wk)			
		Initial CB	2	4	5	7
Bermudagrass						
	Florakirk	<1 (a)*	2 (a)	1 (a)	2 (a)	1 (a)
	Tifton 44	<1 (a)	40(b c)	32 (b-d)	31 (a)	11 (a)
	Tifton 72-81	<1 (a)	63 (c) (d)	37 (c) (d)	15(a)	12 (a)
	Grazer	<1 (a)	10a	10(a-c)	23(a)	9 (a)
	Tifton 68	<1 (a)	82 (d)	43 (d)	21 (a)	42 (b)
Stargrass						
	Florico	0(a)	7(a)	4(a)(b)	1(a)	1(a)
	Ona	<1 (a)	27(a)(b)	48(d)	8(a)	28(a)(b)

* Means within a column followed by different letters are different (P< 0.05) according to Duncan's Multiple Range Test.

Table 7. Crude protein (CP;%) and in vitro organic matter digestion (IVOMD;%) of bermudagrasses and stargrasses mob-grazed in May-June at different frequencies and pooled over 2 yr.

Grass entries		Grazing frequency (wk)			
		2	4	5	7
Bermudagrass					
	Florakirk	11.7 (b)*	8.1 (b)	9.5 (a)	7.7 (b)
	Tifton 44	13.5 (a)	10.2 (a)	9.5 (a)	9.1 (a)(b)
	Tifton 72-81	11.3(b)	7.8 (b)	10.0 (a)	7.8 (b)
	Grazer	9.5 (c)	9.0 (a) (b)	9.3 (a)	9.7 (a)
	Tifton 68	12.7 (a)(b)	8.2 (b)	10.9 (a)	8.5(a)(b)
Stargrass					
	Florico	12.3 (a) (b)	8.1 (b)	9.2 (a)	8.4 (a) (b)
	Ona	13.6 (a)	8.7 (a)(b)	10.2 (a)	8.5 (a)(b)
IVOMD					
Bermudagrass					
	Florakirk	58.5 (a) (b)	55.0 (a) (b)	54.8(b)(c)	51.3 (b)
	Tifton 44	58.3 (a)(b)	52.9 (b)(c)	51.5(c)	50.4 (b)
	Tifton 72-81	55.7 (b)	49.7 (c)	54.2 (b) (c)	49.0 (b)
	Grazer	55.8 (b)	57.8	56.3	58.8 (a)

			(a)(b)	(b)(c)	
	Tifton 68	63.1 (a)	57.6 (a)(b)	62.6 (a)	59.5 (a)
Stargrass					
	Florico	58.6 (a)(b)	58.0 (a)	58.5 (a)(b)	58.2 (a)
	Ona	59.9 (a)(b)	54.8 (a)(b)	57.0 (b)	51.1 (b)
* Means within a column (CP and IVOMD separately) followed by different letters are different (P< 0.05) according to Duncan's Multiple Range Test.					

Small pasture grazing

A grazing study with Florakirk bermudagrass was conducted from May 1986 to December 1988 at the Ona REC. The fertility program on these pastures was 175-47-95 lb/acre N-P_2O_5-K_2O annually, plus 18 lb/acre of micronutrient mix IPI 303 (contains the following elemental content: iron, 18%; zinc, 7.0%; manganese, 7.5%; copper, 3.0%; boron, 3.0%; and molybdemum, 0.2%). Nitrogen was applied in four equal applications (March to September), and P_2O_5 and K_2O were applied once annually in the spring. Each pasture was divided into three equal parts, allowing 2-wk grazing and 4-wk regrowth. The stocking rate was four yearling steers (500 lb/animal) per 1.25 acres. Average daily gain (ADG) was 0.8 lb, and total live weight gain per acre per grazing season (208 days) was 461 lb.

A 3-yr study was conducted on Florakirk and Brazos bermudagrass to compare a 1- and 2-wk cattle rotation for live weight gain and average daily gain. Cattle that were rotated every week were on a 5-pasture rotation, and cattle that were rotated every 2 wk were on a 3-pasture rotation. Both rotation treatments were allowed a 4-wk regrowth period between grazings. The fertility program was similar to the above grazing study. Cattle rotated weekly averaged 5 and 18% higher live weight gain/acre for Florakirk and Brazos, respectively, when compared with a 2 wk rotation (Table 8). Average daily gain of cattle grazing Florakirk and Brazos and rotated every week was 0.62 and 0.93 lb, respectively, compared to 0.59 and 0.73 lb, respectively, with the 2-wk rotation schedule. Florakirk showed little response (5%) compared with Brazos (27%) in favor of the fast rotation, possibly due to the higher quality forage of Florakirk. The animal performance increase from grazing Brazos on the 1-wk rotation may be due to its low digestibility. Consequently, the forage is higher in quality and better utilized when cattle are rotated more frequently. Average daily gain of cattle grazing

Brazos on the 1-wk rotation was 0.31 lb higher compared to Florakirk, mainly due to a lower stocking rate on Brazos. Ruelke (1990), clipping grasses on a 4 to 5-wk schedule, showed Brazos (52% IVOMD) averaged 9 percentage units below Florakirk (61% IVOMD). Brazos, unlike Florakirk is more susceptible to the two-lined spittlebug, which was detrimental to stocking in mid and late summer.

Table 8. Comparison of weekly and biweekly cattle rotation on live weight gain and average daily gain of Florakirk and Brazos bermudagrass (1988 to 1990), Ona.

Grass entry	Live weight gain (lb/acre)			Average daily gain (lb)		
	Rotation (wk) %			Rotation (wk) %		
	1	2	change	1	2	change
Florakirk	380	360	5	0.62	0.59	5
Bravos(t)	390	330	18	0.93	0.73	27

(t) Average over 2 yr.

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INSECTS, NEMATODES, AND DISEASES

Insects

The striped grass looper and fall armyworm both will feed on Florakirk bermudagrass and may destroy the entire crop if not controlled. Florakirk should be monitored for armyworms from mid-June and loopers from mid-August to early November. When scouting the bermudagrass field for armyworms and loopers, kneel to the ground and count the number of worms (1 inch to hair-like) per ft^2 at random locations throughout the field. If the number of worms per ft^2 is 6 to 8 or greater and the size is 0.5 in or smaller, spray immediately with an appropriate insecticide (contact County Extension Office for recommendations). Occasionally, the two-lined spittle bug is found on Florakirk; however, the plants appear unaffected.

Nematodes

The impact of nematodes on perennial crop productivity usually begins in the seedling stage and continues through to crop termination. In many cases, however, the impact may not be immediately obvious or cannot be completely described by the results of a single harvest but must rather be continually measured over the productive life of the crop. The severity of the problem often is also defined by the presence of other soilborne pest and disease problems, which may interact with nematodes to accentuate the problem. Progressive reductions in crop growth, stand density, and harvest yields are therefore generally reflective of the prolonged exposure of perennial crops to plant parasitic nematodes.

At present, no data has been obtained implicating plant parasitic nematodes as economically important pests of this grass. In a limited survey of 10 Florakirk fields of different ages at the Range Cattle REC, major problems with nematodes have not developed. In some of the fields, populations of nematode species within the genera *Helicotylenchus*, *Hoplolaimus*, and *Pratylenchus* have apparently increased to moderate levels on Florakirk. However, no obvious symptoms of nematode damage, such as poor stand establishment, reduced growth, or reduced plant density, have been observed. Continued observation and further research is necessary to establish the importance and damage potential of other nematode species to Florakirk. Therefore, if a nematode problem is suspected in a field, soil and root tissue samples should be removed for diagnosis and submitted to a reputable nematode assay laboratory for analysis.

Disease

A 'leaf blight' disease (Sonoda and Mislevy, 1985) was found on Florakirk bermudagrass in grazing studies during August and September 1983 and again in 1994 at Ona, Florida. Florakirk bermudagrass grazed to a 3-4 in stubble under a continuous system, or under a rotational system with a 4-wk grazing frequency, revealed no foliar blight. The incidence of blight seemed to be associated with dense stands of tall, uncut, ungrazed forage and tended to disappear after October 15. Cattle consumed infected plants relatively well with no signs of rejection. This disease does not appear to be of economic importance.

Rust has been found periodically on Florakirk when plants were allowed to mature 8 to 10 wk before harvest. The rust seemed to be associated with dense stands of tall, uncut, ungrazed forage. No indication of rust has been reported in north Florida when Florakirk was cut at 4- to 5-wk intervals.

Tar spot has occurred on Florakirk at the Range Cattle REC. Numerous lesions coalesce and cause leaf browning on lower leaves with the disease progressing

to higher leaves over time. Tar spot tends to be more severe in plantings when cutting or grazing is delayed. Tar spot has not prevented good regrowth of Florakirk after a cutting even though the disease was prevalent one half to two thirds up the plants. Increasing the cutting or grazing frequency should minimize the impact of tar spot. In fact, utilizing Florakirk in an intensive hay harvest system results in little or no leaf diseases.

PRODUCTION AND MANAGEMENT

Establishment

Florakirk bermudagrass is established vegetatively from crowns and rhizomes or mature stem pieces including stolons (runners). When placed in a moist, firm seed bed, roots develop from nodes in 5 to 10 days. Freshly harvested planting material (1000 to 1200 lb/acre) should be distributed on clean cultivated soil and covered by disking 2 to 4 in deep (75% of each stem covered with soil) or crimping (roller with a series of 14 disks 0.25 in thick welded perpendicular to roller axis and extending 8 in beyond roller drum) by pushing vegetative material lying on the soil surface 4 in into the well-prepared seed bed. Freshly harvested vegetative material must be disked or crimped into the seed bed within 30 minutes after distribution to prevent drying of plant material. The seed bed should be firmed with a heavy roller, passing one to three times depending on soil moisture.

To establish Florakirk or any other grass successfully, the seed bed must be clean (free of CB and all other vegetation) and moist. If CB had been growing on the field, the planting rate should be increased to 1500 lb/acre. It is also important to spread the plant material uniformly across the field with no voids larger than 3 ft in diameter.

Seven to 10 days after planting Florakirk, when signs of growth are evident, the field should be sprayed with 1.0 lb/acre Weedmaster® (0.25 lb/acre dicamba + 0.72 lb/acre 2,4-D amine) or equivalent even though the field may appear weed-free. The herbicide will control many sedges and broadleaves that are just emerging (< 1 in tall). Follow label directions on all pesticide usage.

Lime and Fertilizer

Soil test results should be used in determining lime and fertilizer requirements. Bermudagrass generally performs well at a pH range of 5.5 to 6.5, with available calcium at 1000 to 1200 lb/acre. The bermudagrass fertilization program should be divided into two parts: establishment and maintenance.

Establishment Fertilization

Most flatwood soils in Florida are deficient in plant nutrients, therefore Florakirk bermudagrass needs to be fertilized about 7 days after planting. When new shoots are approximately 1 to 3 in tall, fertilize with about 35-35-35 lb/acre N-P_2O_5-K_2O plus micronutrients, if needed. About 30 to 40 days after the initial application, plants should receive additional 40 to 50 lb/acre N when fields are not in standing water. This establishment fertilization and herbicide program should allow Florakirk to attain a height of 24 in or more in 75 days or less.

Maintenance fertilization

All bermudagrasses require a high level of fertility. Under an intensive grazing program, Florakirk should receive 60-15-30 lb/acre N-P_2O_5-K_2O (unless otherwise indicated by soil test), at least three times per year (early March, late June, and mid September) to encourage continuous forage production throughout the warm season. When the bermudagrass is harvested for hay, about 70-30-60 lb/acre N-P_2O_5-K_2O should be applied 4 to 5 wks before each cutting. If micronutrients have not been applied within 3 to 4 yr or the bermudagrass is planted on new land (recently developed from the native condition), about 10 lb/acre IPI 303 or equivalent may be required. This fertilization program should be adequate to produce about 1.5 to 2.0 tons/acre hay after 4 to 5 wk of regrowth, provided suitable environmental conditions occur.

Management and Utilization

Clipping and grazing studies have demonstrated that Florakirk bermudagrass should be allowed a rest period of 4 wk between grazing and 4 to 5 wk between hay cutting. If the rest period is shorter, forage quality increases, but persistence of the stand may decrease. If the rest period between grazing is increased to 7 wk, yield and persistence could improve, but forage quality and palatability will decrease. Unlike stargrasses, bermudagrasses tend to perform well under a relatively short stubble height.

Hay

Florakirk has been released for hay production basically for north Florida and south Georgia growers because of its fine stems, persistence, high yields, and good quality. To make good quality Florakirk bermudagrass hay or silage is both a timely and an intensive process. If 7 wk or more are allowed between harvests, the quality of this fine stemmed grass will be low and cattle may reject considerable amounts. Commercial growers must harvest bermudagrasses on a 4 to 5 wk schedule. Generally, two spring (May and June) harvests can be obtained in central Florida provided cattle are removed by early March and the field is fertilized by mid-March, when moisture is still available in central Florida

soils. Florakirk tends to produce spring DM yields similar to Coastal; however, fall yields were 24% higher for Florakirk than for Coastal in Gainesville.

In central Florida, Florakirk (0.74 tons/acre) will produce about double the DM yield of Pensacola bahiagrass (0.35 tons/acre) during October and November. These fall Florakirk yields are similar to or slightly better than for Florona and Florico stargrasses under similar conditions. Remember, to obtain maximum fall yields, Florakirk must be well fertilized in mid-September. All dates and rates of fertilizer may require adjustment to meet weather and soil fertility variables.

Grazing

Florakirk bermudagrass has persisted well under grazing at the Range Cattle REC; however, leaf spot diseases tend to be more prevalent under grazing than hay harvest systems. Unlike the stargrasses, which require a 6 to 10 in stubble for best persistence, Florakirk tends to persist well and have less leaf spot disease when grazed to a short (3 to 4 in) stubble height. For best results, Florakirk should be rotationally grazed, allowing a 4-wk rest period between grazing. Remember, bermudagrass, like stargrass, has a high fertility requirement. Therefore, frequent fertilization is necessary for continued growth and production.

PLANTING MATERIAL DISTRIBUTION

Information regarding planting material of Florakirk bermudagrass can be obtained from the following offices:

Florida Foundation Seed Producers, Inc.
P.O. Box 309
Greenwood, Florida 33443
Telephone 904-594-4721

Range Cattle Research and Education Center
Rt 1, Box 62
Ona, Florida 33865
Telephone 813-735-1314

LITERATURE CITED

Kalmbacher, R., P. Mislevy, and F. G. Martin. 1989. Evaluation of new stargrasses and bermudagrasses at Immokalee. IFAS, Agricultural Research and Education Center, Ona Research Report RC-1989-6.

Mislevy, P., O. C. Ruelke, and F. G. Martin. 1988. Grazing evaluation of Cynodon species. Soil and Crop Sci. Soc. Florida Proc. 47:207-212.

Ruelke, O. C. 1990. Florida field and forage crop variety report, 1989. IFAS, Agronomy Research Report Ay 90-93.

Sonoda, R. M., and P. Mislevy. 1985. Foliar blight of Cynodon spp. forage caused by Rhizoctonia solani in Florida. Plant Dis. 69:811.