

Bermudagrass Encroachment into Creeping Bentgrass Greens

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Experiments on bermudagrass encroachment into creeping bentgrass greens were conducted at the Georgia Station from 1986 through 1991. The experiments were conducted in four phases:

First experiment - 1986 - A preliminary study was conducted to identify herbicide-plant growth regulator (PGR) treatments that showed maximum injury to bermudagrass and minimum creeping bentgrass injury. Several herbicides applied alone or with PGRs were applied to pure stands of each grass mid-May. Herbicide-PGR treatments and rates of application are given in Table 1. From these treatments, Tupersan, Cutless, Tupersan + Cutless, Prograss + Cutless, and Prograss + Embark were selected to include in the second experiment.

Table 1. Herbicide-PGRs and rates of application. Experiment I, 1986.

TREATMENTS ¹	RATE LB AI/A
Untreated	-
Tupersan	48.0
Prograss	1.5
Embark	0.5
Limit	3.0
Cutless	1.0
Prograss + Cutless	1.0 + 0.38
Prograss + Embark	1.0 + 0.12
Prograss + Limit	1.0 + 0.75
Tupersan + Cutless	48 + 0.38
Tupersan + Embark	48 + 0.12
Tupersan + Limit	48 + 0.75

¹Treatments were applied to creeping bentgrass and bermudagrass May 13, 1986.

Second experiment - 1987 and 1988 - The herbicide-PGR treatments selected from the first experiment were applied to creeping bentgrass inter planted with Tifway, Tifgreen, and common bermudagrasses at rates given in Table 2. Each chemical was applied late September plus mid-April or only as a single mid-April application. All herbicide-PGR treatments injured creeping bentgrass higher when applied in September than when applied in April. The higher injury in September occurred because bentgrass root system had not recovered from the summer stress. There was no advantage in bermudagrass suppression during May and June from September plus April treatments when compared with the single April treatment.

Table 2. Herbicide-PGRs and rates of application. Experiment II, 1987-1988.

TREATMENTS	RATES LB AI/A	DATE APPLIED ¹
Untreated	-	-
Tupersan	48.0 48.0	September + April April
Tupersan + Cutlass	48.0 + 0.75 48.0 + 0.75	September + April April
Tupersan + Embark	48.0 + 0.38 48.0 + 0.38	September + April April
Cutlass	1.25 1.25	September + April April
Prograss + Cutless	1.5 + 0.75 1.5 + 0.75	September + April April
Prograss + Embark	1.5 + 0.38 1.5 + 0.38	September + April April

¹Chemicals were applied September 29 and April 15 ± 1 day during 1987 and 1988.

When Embark was mixed with Tupersan or Prograss and applied in April, creeping bentgrass injury was severe (>30%). The injury to bentgrass from other chemicals applied in April was within an acceptable (<30%) range.

Bermudagrass was effectively suppressed from April herbicide-PGR treatments from late May to early June, but the grass recovered rapidly after these dates. In all instances, Tupersan + Cutless and Prograss + Cutless suppressed bermudagrass growth more than Tupersan and Cutless applied alone.

These results indicate that Tupersan + Cutless and Prograss + Cutless were safe to apply to creeping bentgrass in April. Bermudagrass was effectively suppressed from both combination treatments for approximately 6 weeks following a single April application.

Third experiment - 1988 and 1989 - Cutless applied alone or in sequence with Tupersan or Prograss was applied in multiple applications during spring and summer to creeping bentgrass inter planted with Tifway, Tifgreen, and common bermudagrasses. All chemicals were applied initially mid-April. The rates and frequency of applications are given in Table 3.

Table 3. Herbicide-PGR rates and frequency of application. Experiment III, 1988-89.

CHEMICAL	RATE BY DATE OF APPLICATION ¹ lb ai/A		
	APRIL 15	JUNE 1	JULY 12
Untreated	-	-	-
Cutless	1.25	-	-
	1.25	1.25	-
	1.25	0.63	-
	1.25	0.63	0.63
Tupersan + Cutless	48 + 0.75	-	-
	48 + 0.75	48 + 0.75	-
	48 + 0.75	24 + 0.38	-
	48 + 0.75	24 + 0.38	24 + 0.38
Prograss + Cutlass	1.5 + 0.75	-	-
	1.5 + 0.75	1.5 + 0.75	-
	1.5 + 0.75	0.75 + 0.38	-
	1.5 + 0.75	0.75 + 0.38	0.75 + 0.38

	1.5 + 0.75	1.5 + 0.75	1.5 + 0.75
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¹Chemicals were applied at given dates over a 2-year period.

Prograss + Tupersan and Prograss + Cutless were safe to creeping bentgrass when each was applied April 15 at a full rate and followed by one-half rate on June 1. The injury was increased to an unacceptable level when the June 1 application was increased to a full rate or when one-half rates were applied June 1 and July 12. The injury was severe when Cutless was applied as repeated treatments in June or July regardless of rate.

Cutless did not generally suppress bermudagrass growth effectively after June 1 regardless of rates and frequency of applications. Tupersan + Cutless applied at full rate in April and followed by one-half rate June 1 effectively suppressed bermudagrass growth until mid-June to mid-July. The suppression with Tupersan + Cutless was not improved when the rate the second application was increased or when a third application was made July 12. Prograss + Cutless applied at full rate in April and one-half rate June 1 suppressed bermudagrass growth effectively until mid-August 1988, but the suppression 1989 was effective only until early June. These results show that repeated chemical applications suppressed bermudagrass growth longer than did a single application. Although the suppression was higher from Prograss + Cutless than from Cutless or Tupersan alone, none of the chemicals provided consistent bermudagrass suppression at rates included in this experiment throughout the summer both years.

Fourth experiment - 1989 through 1991 - Bermudagrass inter planted into creeping bentgrass was winter killed in 1990. Bentgrass tolerance was evaluated for 3 years (1989 through 1991) and bermudagrass suppression was evaluated in 1989 and 1991 from the herbicide-PGR treatments. Prograss + Cutless and Tupersan + Cutless were applied initially to creeping bentgrass inter planted with bermudagrasses at a full rate March 12 or April 8 ± 1 week. Repeated applications at one-fourth rates were made at various times after the original application. Time and frequency rates of herbicide-PGR applications are given in Table 4. Siduron was applied at a full rate to separate plots in March and April and at monthly intervals through August. Acclaim was applied initially in April and at monthly intervals through August.

Table 4. Herbicide-PGR rates and frequency of application. Experiment IV, 1989-1991.

CHEMICAL	RATE LB AI/A	APPLICATION DATE ¹
Untreated	-	-
Prograss	1.5 + 0.75	April 8

+ Cutless	+ 0.75 + 0.38	May 24
	1.5 + 0.75 + 0.38 + 0.19	April 8 May 24 + Jun 16
	1.5 + 0.75 + 0.38 + 0.19	April 8 May 24 + Jun 16 + Jul 9
	1.5 + 0.75 + 0.38 + 0.19	April 8 May 24 + Jun 16 + Jul 9 + Jul 26
	1.5 + 0.75 + 0.38 + 0.19	March 12 Apr 29 + May 20 + Jun 10
	1.5 + 0.75 + 0.38 + 0.19	March 12 Apr 29 + May 20 + Jun 10 + Jul 1
Tupersan + Cutless	48 + 0.75 + 12 + 0.19	April 8 May 24 + Jun 16 + Jul 9 + Jul 26
	48 + 0.75 + 12 + 0.19	March 12 Apr 29 + May 20 + Jun 10 + Jul 1
	48 + 0.75 + 12 + 0.19	March 12 Apr 29 + May 20 + Jun 10 + Jul 1 + Jul 24
Tupersan	48	Apr 8 + May 9 + Jun 9 + Jul 8 + Aug 9
	48	Mar 12 + Apr 8 + May 9 + Jun 9 + Jul 8 + Aug 9
Acclaim	0.13 + 0.07	Apr 8 May 9 + Jun 9 + Jul 8 + Aug 9
	0.07	Apr 8 May 9 + Jun 9 + Jul 8 + Aug 9

¹Chemicals were applied within ± 1 week over a 3-year period.

Prograss + Cutless applied initially at a full rate in March or April injured creeping bentgrass more in 1989 and 1990 than in 1991. However, the injury was temporary and bentgrass recovered fully within 3 to 4 weeks. Bentgrass tolerated the one-fourth Prograss + Cutless treatments throughout the spring and summer. Tupersan applied alone or with Cutless caused moderate to severe injury to bentgrass during spring and summer 1989, but not the following 2 years. Bentgrass injury to Acclaim was severe each year and should not be applied to bentgrass.

Tupersan applied in March and April to separate plots and repeated at monthly intervals suppressed the growth of Tifway and common bermudagrass until after mid-June, but the bermudagrass recovered from the treatments by mid-July. Tifgreen was not suppressed with Tupersan after June 1. Acclaim suppressed common bermudagrass throughout the spring and summer, but the chemical had little effect on growth of Tifway or Tifgreen

bermudagrasses.

Tupersan + Cutless applied initially in March suppressed bermudagrass more than when treatment was delayed until April when each treatment date was followed by four timely one-fourth applications. Tifway and common bermudagrass treated with Tupersan + Cutless in March and followed by timely repeated applications were effectively suppressed until after late July, but recovered in August. Tifgreen bermudagrass treated at the same time was suppressed until after mid-June but recovered in July.

Prograss + Cutless suppressed bermudagrass similarly whether the initial application was made in March or April, providing four timely one-fourth rate applications were made. When compared with untreated turf, the suppression of Tifway and Tifgreen bermudagrass was approximately 74% and common bermudagrass was approximately 87% in early September from Prograss + Cutless treatments. These results indicate that multiple Prograss + Cutless treatments suppressed bermudagrass longer than did Tupersan applied alone or with Cutless.

Summary. The growth of either Tifway, Tifgreen, or common bermudagrass was effectively suppressed throughout the spring and summer with Prograss + Cutless. The suppression was similar whether chemicals were applied initially at full rate (1.5 + 0.75 lb ai/A) mid-March or early April, providing four timely applications at one-fourth rates were made during spring and summer. The second application should be made at 6 weeks after the initial application and then repeated at 3 weeks. To obtain optimum bermudagrass suppression with Prograss + Cutless, it is important to apply the initial treatment from the time bermudagrass starts to break dormancy until the turf is about 20% green. It is also important to repeat the applications on schedule. When treatments are delayed for only a few days, bermudagrass growth may occur and Prograss + Cutless will not be effective after bermudagrass initiates growth.