

Lateral Regrowth of Creeping Bentgrass Fairways and Greens Following Applications of Cutless* 50W (flurprimidol) and Trimmit® 2SC (paclobutrazol)

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Introduction

Plant growth regulators (PGRs) such as Cutless 50W (flurprimidol) and Trimmit 2SC (paclobutrazol) are frequently used by golf course superintendents for annual bluegrass (*Poa annua*) control or suppression in cool-season grass fairways such as creeping bentgrass [*Agrostis stoloniferous* L. var. *palustris* (Huds.)], Kentucky bluegrass (*Poa pratensis* L.), and perennial ryegrass (*Lolium perenne* L.).

Cutless 50W and Trimmit 2SC are Type II, class B plant growth regulators (PGR) inhibiting the biosynthesis of gibberellic acid (GA) early in the pathway. Specifically, flurprimidol and paclobutrazol both target the enzyme *cytochrome P450 monooxygenase* blocking the formation of ent-kaurenoic acid, a precursor to active GA's. Gibberellic acid is a plant hormone responsible for cell or stem elongation. Therefore, by suppressing the production of active GA, shoot growth is reduced resulting in decreased vegetative growth, reduced clippings and mowing frequency, and improved turfgrass quality, color, and density.

How Do Type II Class B PGR's Suppress *Poa annua*?

Cutless 50W and Trimmit 2SC are commonly used for *Poa annua* management and turf enhancement in creeping bentgrass golf greens, fairways, and tees. Previous research has demonstrated that both PGRs can be used to significantly reduce *Poa annua* infestations while increasing creeping bentgrass populations. Cutless 50W and Trimmit 2SC selectively suppress the growth of *Poa annua* to a greater degree compared to perennial turfgrasses, such as creeping bentgrass, hence shifting the competitive growth advantage away from *Poa annua* and towards creeping bentgrass. Therefore, over time,

creeping bentgrass is able to grow laterally or "creep" into the suppressed *Poa annua* stand, resulting in successful conversion. This allows for a consistent and gradual conversion from *Poa annua* to creeping bentgrass with minimal disruption to the playability of the turfgrass.

Do Type II Class B PGR's Regulate Creeping Bentgrass Growth Equally?

As previously mentioned, the selective growth suppressive activity of both Cutless 50W and Trimmit 2SC on *Poa annua* has been well established. However, limited research has been performed on the resulting growth suppressive activity of both PGRs on creeping bentgrass. Perennial turfgrass suppression or regulation is an important factor in *Poa annua* management programs because it directly influences the recovery rate and overall health of a desired turfgrass, such as creeping bentgrass. Therefore, a study was performed to evaluate the lateral recovery or regrowth of creeping bentgrass following applications of Cutless 50W and Trimmit 2SC. The objective of this research was to measure the lateral regrowth or recovery of creeping bentgrass in a golf course fairway and green following the application of two Type II Class B PGRs.

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Materials and Methods

Two studies were conducted during the summer of 2004 on a fairway and practice putting green at the Golf Preserve in Westfield, IN. Regular golf course fairway and green management practices were implemented with regard to mowing, irrigation, and fertilization in both studies. No additional PGRs were applied throughout the duration of the study. In order to evaluate lateral regrowth (RG) of creeping bentgrass, soil cores were extracted from each replicate plot prior to PGR application and backfilled with topdressing sand. The diameter of the soil cores were 5 cm (2") for the golf green study and 10.8 cm (4 1/4") for the fairway. Soil cores were approximately 10 cm (4") deep. In order to measure lateral RG, a wire mesh grid was constructed equal to the dimension of the original extracted core. The grid contained 210 and 80 square holes (0.4 cm² in area) for the fairway and golf green study, respectively. A green shoot present in a 0.4 cm² square denoted a point. Digital images were taken every 2 weeks with the wire mesh grid overlaying the backfilled soil core and percent lateral RG was calculated with the equation: [green shoot points/total squares (210 or 80)].

PGR treatments were applied every 4 weeks on June 15 and July 16, 2004 with a CO₂ backpack sprayer. Equal label recommended rates based on pounds active ingredient/acre (lbs ai/A) were applied with Cutless 50W and Trimmit 2SC. Primo MAXX[®] was also included. Treatments rates are found in Table 1.

The study was a randomized complete block design with 3 replications. Lateral RG data was analyzed using ANOVA and means separation was performed with Fisher's LSD with a p=0.05.

Results

Golf Green Study

At 2 weeks after the initial application (WAIT) no differences in lateral regrowth occurred between treatments. However, by 4 WAIT, Trimmit 2SC at 16 fl oz/A (0.25 lbs ai/A) reduced lateral RG compared to all treatments by 9 to 13% (Figure 1).

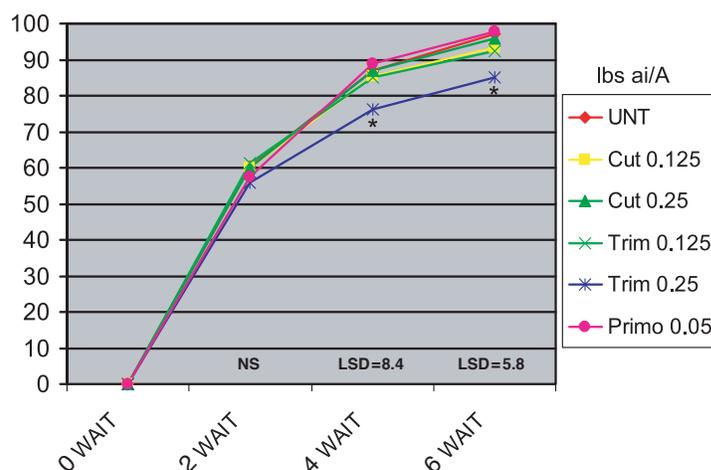


Figure 1. Percent lateral RG of a creeping bentgrass golf green following two applications of Cutless 50W, Trimmit 2SC and Primo MAXX in Westfield, Indiana.

*Significant from untreated and both Cutless 50W rates according to Fisher's LSD ($\alpha=0.05$) test.

Table 1

No.	Treatment	Golf Green Study oz/A (lbs ai/A)	Fairway Study oz/A (lbs ai/A)
1	Untreated		
2	Cutless 50W	4 oz/A (0.125)	8 oz/A (0.25)
3	Cutless 50W	8 oz/A (0.25)	16 oz/A (0.50)
4	Trimmit 2SC	8 fl oz/A (0.125)	16 fl oz/A (0.25)
5	Trimmit 2SC	16 fl oz/A (0.25)	32 fl oz/A (0.50)
6	Primo MAXX 1EC (+ Cutless 50W for fairway)	6 fl oz/A (0.05)	6 fl oz/A (0.05) + 4 oz/A Cutless (0.125)

Table 1. Rates of Cutless 50W, Trimmit 2SC, and Primo MAXX applied to a creeping bentgrass golf green and fairway during the summer of 2004 in Westfield, IN.

By 6 WAIT or 2 weeks after the second application, Trimmit 2SC at 16 fl oz/A (0.25 lbs ai/A) reduced lateral RG by 12% compared to untreated plots and Primo at 6 oz/A and 8 to 11% compared to both rates of Cutless 50W (Illustration 1). Trimmit 2SC at 8 fl oz/A (0.125 lbs ai/A) maintained 8% greater lateral RG compared to the 16 fl oz/A rate (0.25 lbs ai/A).

Fairway Study

Similar results occurred in the fairway study where rates of Cutless 50W and Trimmit 2SC were doubled compared to the rates used in the golf green study. At 2 WAIT, Cutless 50W at 16 oz/A (0.5 lbs ai/A) and untreated plots maintained $\geq 6\%$ compared to other treatments (Figure 2). By 4 WAIT, Trimmit 2SC at 32 fl oz/A (0.5 lbs ai/A) reduced lateral RG by 11 to 13% compared to Cutless 50W at 8 (0.25 lbs ai/A) and 16 oz/A (0.5 lbs ai/A). Therefore, at 4 WAIT, Trimmit 2SC reduced lateral RG by 13% compared to Cutless 50W when both PGRs were applied at 0.5 lbs ai/A. Trends continued at 6 WAIT, with Trimmit 2SC at 32 fl oz/A (0.5 lbs ai/A) reducing lateral RG by 12 to 14% compared to treatments containing Cutless 50W and the untreated (Illustration 2). At the final rating date, at 8 WAIT, plots receiving Trimmit 2SC at 32 fl oz/A

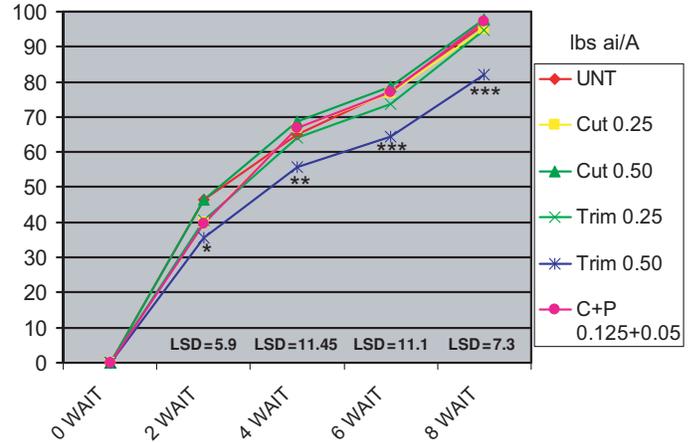


Figure 2. Percent lateral RG of a creeping bentgrass fairway following two applications of Cutless 50W, Trimmit 2SC and Primo MAXX in Westfield, Indiana.

*Significant from untreated and Cutless 50W at 0.5 lbs ai/A according to Fisher's LSD ($\alpha=0.05$) test.

**Significant from Cutless 50W at 0.5 lbs ai/A according to Fisher's LSD ($\alpha=0.05$) test.

***Significant from untreated and both Cutless 50W rates according to Fisher's LSD ($\alpha=0.05$) test.

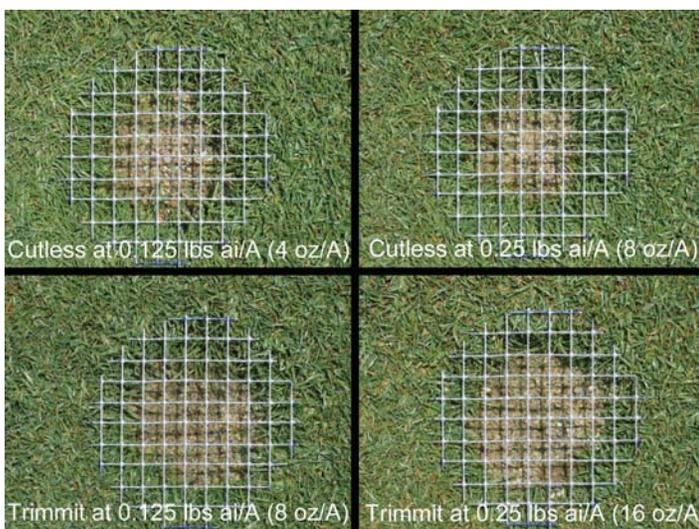


Illustration 1. Field shots of percent lateral RG ratings of a creeping bentgrass golf green following applications of Cutless 50W, Trimmit 2SC and Primo MAXX in Westfield, Indiana at 6 weeks after the initial treatment.

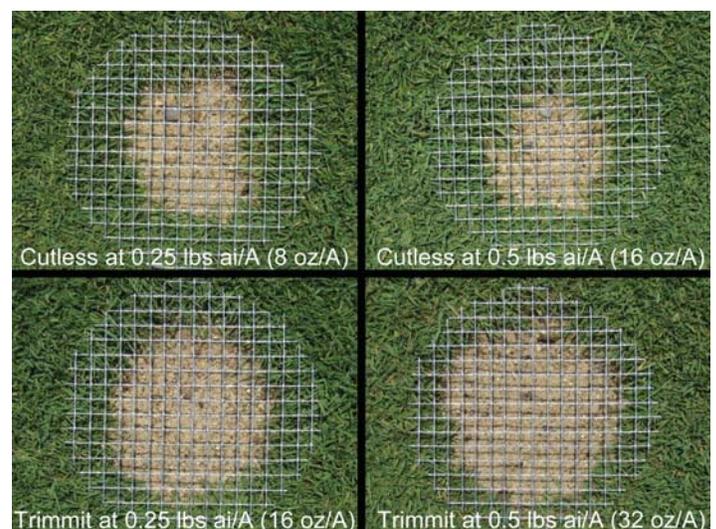


Illustration 2. Field shots of percent lateral RG ratings of a creeping bentgrass fairway following applications of Cutless 50W, Trimmit 2SC and Primo MAXX in Westfield, Indiana at 6 weeks after the initial treatment.

(0.5 lbs ai/A) reached 82% RG, whereas Cutless 50W at 0.5 lbs ai/A reached 98% (Illustration 3). The tank-mix containing Cutless 50W + Primo MAXX 1EC did not influence lateral RG at any rating date.

Conclusions

In these studies, the lateral RG of creeping bentgrass differed in response to equal lbs ai/A rates of Cutless 50W and Trimmit 2SC. At the final rating date, the high rate of Trimmit 2SC reduced creeping bentgrass lateral RG significantly by 11 and 16% compared to plots receiving the same ai/A rate of Cutless 50W in the golf green and fairway study, respectively. The low rate Trimmit 2SC did not reduce lateral RG in either study. Additionally in both studies, the lateral RG of creeping bentgrass following Cutless 50W applications at all rates evaluated did not differ from untreated plots at study's end. In contrast, the high rate of Trimmit 2SC reduced lateral RG by 12 and 14% compared to untreated plots in the golf green and fairway study, respectively. Primo MAXX alone and the Cutless 50W + Primo MAXX tank-mix did not significantly influence lateral RG of creeping bentgrass in either study.

Future research will continue to investigate the effects of various rates and timings of Cutless 50W and Trimmit 2SC on the lateral RG of creeping bentgrass and other perennial turf species such as Kentucky bluegrass and perennial ryegrass. Future studies will evaluate lateral RG of creeping bentgrass over a yearly program consisting of 4 to 6 applications of Cutless 50W and Trimmit 2SC at various rates. In summary, these data suggest Cutless 50W used in a *Poa annua* conversion program may provide a more vigorous and faster bentgrass lateral RG, therefore allowing bentgrass to more efficiently out compete *Poa annua* populations. In addition, Cutless 50W applications may encourage creeping bentgrass recovery from mechanical damage such as divots and ball marks.

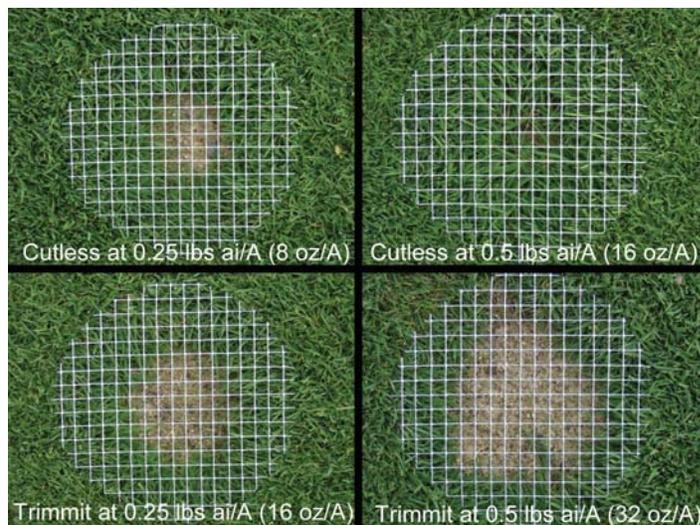


Illustration 3. Field shots of percent lateral RG ratings of a creeping bentgrass fairway following applications of Cutless 50W, Trimmit 2SC and Primo MAXX in Westfield, Indiana at 8 weeks after the initial treatment.