



Controlling creeping bentgrass in Kentucky bluegrass

A new herbicide safely and effectively removes creeping bentgrass from Kentucky bluegrass.

Creeping bentgrass (*Agrostis stolonifera* L.) creates a dense, high-quality playing surface, and its use on golf course fairways is increasing steadily (4). However, because of its aggressive growth habit, creeping bentgrass often spreads into adjacent Kentucky bluegrass (*Poa pratensis* L.) (5), where it forms unsightly scattered patches, disrupting turf uniformity. This often occurs during seeding, but it can also result from scalping Kentucky bluegrass that is next to creeping bentgrass.

Unfortunately, there have been no effective means of efficiently removing creeping bentgrass patches from Kentucky bluegrass without harming the Kentucky bluegrass. The herbicide Tenac-

ity (mesotrione; Syngenta Corp.) controls several broadleaf and annual grassy weeds, including large crabgrass, goosegrass, nimblewill, ground ivy, common purslane, black medic and dandelion (7,8). The active ingredient in Tenacity is based on a naturally occurring compound produced by the bottlebrush plant (*Callistemon citrinus* Stapf.). Previous research has shown that Tenacity exhibits post-emergence herbicidal activity on creeping bentgrass without harming Kentucky bluegrass (2,3,7). (*Editor's note: Tenacity has been approved or submitted for approval for use on turf in the continental U.S. except for Arizona and California.*)

Selective removal requires effective control of the unwanted weed while minimizing detrimental effects on the desirable species. Tenacity persists in the soil for a relatively short period (the half-life is 4.5 to 32 days depending on the soil pH) (6), so the proper application protocol is essential for successful weed control. The objective of this research was to evaluate how the rate and number of Tenacity applications affected creeping bentgrass control in Kentucky bluegrass.

Methods

Our research was conducted at the Iowa State University Horticulture Research Station, Ames, Iowa. Turfgrass was a 20-year-old mixed sward of Penncross creeping bentgrass and an unknown cultivar of Kentucky bluegrass next to two established putting greens. Plots were irrigated daily



The active ingredient in Tenacity, mesotrione, has a bleaching effect on creeping bentgrass, but not on Kentucky bluegrass. Here a mixed sward of Kentucky bluegrass and creeping bentgrass plot was treated with Tenacity, bleaching the bentgrass but leaving the Kentucky bluegrass unscathed. Photos by M. Jones

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and mowed to 1.5 inches (38.1 millimeters) three times per week.

Experiments, 2004

The experiments were initiated on May 5, 2004, when Tenacity 4SC was applied at 0, 2, 4, 8, 16, 24 and 32 ounces/acre (0, 0.15, 0.30, 0.60, 1.2, 1.8 and 2.4 liters/hectare). Six weeks later, on June 17, 2004, half the plots received a second application at the same rate used in the

first application. A six-week interval was used between applications to ensure the second application would be applied to fully recovered creeping bentgrass tissue in anticipation that absorption of Tenacity would increase.

Tenacity was mixed with a nonionic surfactant at 0.25% volume/volume, and total spray volume was 130.2 gallons/acre (1,218 liters/hectare). Tenacity applications were made with a 5-foot (1.5-meter) boom with three flat-fan nozzles. On May 24, 2004, all plots received 1.0 pound nitrogen/1,000 square feet (48 kilograms/hectare) with urea.

Weekly evaluations of overall turfgrass quality (Kentucky bluegrass and creeping bentgrass) based on color, uniformity and plant density were assessed visually on a scale of 1 to 9, where 1 is the worst, 6 is acceptable and 9 is the best. Percent creeping bentgrass control was determined by using a grid (9,10).

Additional study

In 2005, an additional study was conducted that included more applications of Tenacity at lower rates. On July 27, 2005, Tenacity was applied at 4 or 6 ounces/acre (0.30 or 0.45 liter/hectare). Repeat applications followed at two-week intervals until plots had received two, three or four applications of Tenacity. Plot size, application method and management techniques were identical to those described earlier. Percent control of creeping bentgrass was determined 14 days after each treatment and in the following spring using a grid.

3 months after treatment

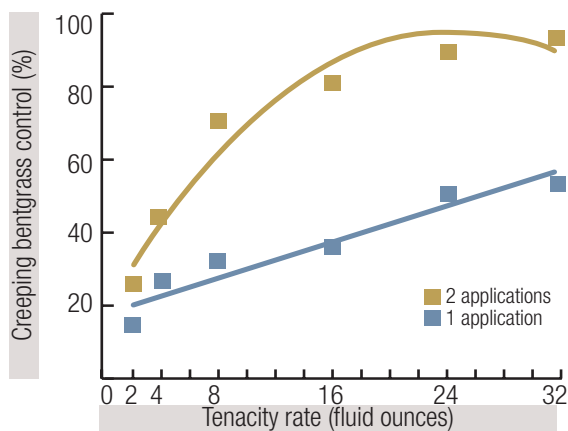


Figure 1. Percent control of creeping bentgrass in Kentucky bluegrass in field plots three months after receiving one or two applications of Tenacity at 2, 4, 8, 16, 24 and 32 ounces/acre (0.15, 0.30, 0.6, 1.2, 1.8, and 2.4 liters/hectare). The first application occurred on May 5, 2004, and plots that received a second application were treated again on June 17, 2004.

1 year after treatment

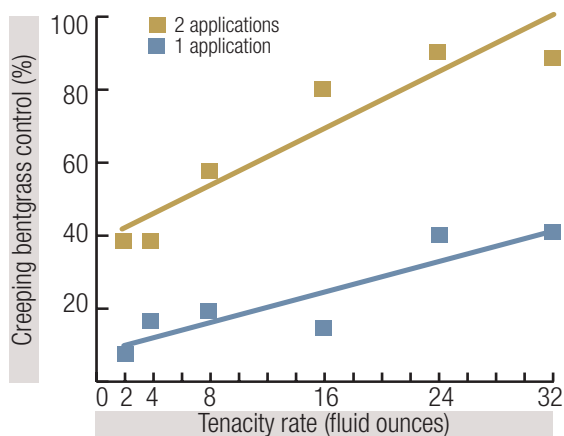


Figure 2. Percent control of creeping bentgrass in Kentucky bluegrass in field plots one year after receiving one or two applications of Tenacity at 2, 4, 8, 16, 24 and 32 ounces/acre (0.15, 0.30, 0.6, 1.2, 1.8, and 2.4 liters/hectare). The first application occurred on May 5, 2004; plots that received a second application were treated again on June 17, 2004.

Results

Six-week intervals

Two applications of Tenacity controlled creeping bentgrass better than single applications (Figure 1). Despite increasing application rates up to 32 ounces/acre (2.4 liters/hectare), single applications of Tenacity only achieved a maximum of 60% creeping bentgrass control. Two applications of Tenacity at 8 ounces/acre (0.6 liter/hectare), controlled 69% of creeping bentgrass, and control reached 96% at the highest application rate (Figure 1).

One year after Tenacity applications, control slightly decreased as the remaining creeping bentgrass recovered and reestablished (Figure 2). Creeping bentgrass control from a single application of 32 ounces/acre (2.4 liters/hectare) was 43%, a 17% drop. However, two applications of Tenacity at 16 ounces/acre (1.2 liters/hectare) and



greater still controlled at least 80% of creeping bentgrass.

These results agree with previous research that show Tenacity provides effective post-emergence control of creeping bentgrass in Kentucky bluegrass (7). However, the effectiveness may be increased further by using different interval timings. We used a six-week interval between applications to ensure the second application would be applied to fully recovered creeping bentgrass in anticipation that absorption would increase. In addition, the label indicates a maximum single application rate of 8 ounces/acre (0.6 liter/hectare) and a yearly maximum of 16 ounces/acre (1.2 liters/hectare). Therefore, an additional study was conducted to evaluate more frequent applications at lower rates.

Two-week intervals

All treatments of Tenacity resulted in at least 93% control of creeping bentgrass regardless of application rate (Table 1). Other researchers have found that multiple applications of Tenacity at two-week intervals controlled at least 92% of creeping bentgrass (3). Minimal recovery of creeping bentgrass was observed 56 days after the initial applications and the following spring (Table 1).

Turf quality

Kentucky bluegrass was not affected by Tenacity applications at any point in this study. Reductions in overall turfgrass quality resulted from the lack of plant density after the creeping bentgrass died (Table 2). Where creeping bentgrass comprises a large percentage of turfgrass areas, removal would create gaps in the canopy, allowing weeds to colonize. Seeding cool-season grasses into the treated areas may improve overall turfgrass quality faster, rather than simply allowing the established Kentucky bluegrass to fill that void. Previous research (1) shows that tall fescue (*Festuca arundinacea* L.), Kentucky bluegrass and perennial ryegrass (*Lolium perenne* L.) will germinate in the presence of Tenacity.

Summary

Successful post-emergence control of creeping bentgrass in Kentucky bluegrass depends on effective creeping bentgrass control while minimizing effects on overall turfgrass quality. The ability of Tenacity to control creeping bentgrass depends on using the correct rate, number of applications and application interval. Two applications of Tenacity,

Creeping bentgrass control

Tenacity (ounces/acre)	No. of applications*	% creeping bentgrass control [†]			
		28 DAIT [‡]	42 DAIT	56 DAIT	Spring [§]
0	0	0 a	0 a	0c	0a
4	2	99 a	99 a	93 a	90 a
6	2	100 a	99 a	97 ab	94 a
4	3	98 a	99 a	95 ab	94 a
6	3	100 a	100 a	99 ab	98 a
4	4	99 a	100 a	100 a	97 a

* The first application occurred July 27, 2005, and the second application on Aug. 10, 2005. Plots that received a third application were treated on Aug. 24, 2005; plots that received a fourth application were treated on Sept. 7, 2005. Plots were irrigated daily and fertilized with urea (46-0-0, N-P-K) at 1 pound nitrogen/1,000 square feet (48 kilograms/hectare) on May 24, 2005. Values represent means of four replications.
[†]Means within columns followed by the same letter are not significantly different from each other.
[‡]DAIT, days after initial treatment.
[§]Spring ratings of creeping bentgrass control were evaluated on June 17, 2006.
^{||}Tenacity rates were: 6 ounces/acre (0.45 liter/hectare) on July 27 and Aug. 10, 2005 and 4 ounces/acre (0.30 liter/hectare) on Aug. 24, 2005.

Table 1. Creeping bentgrass control is affected by Tenacity rate and application timing.



This research plot received three applications of Tenacity at 4 ounces/acre (0.30 liter/hectare).

ity, six weeks apart, at 8 ounces/acre (0.6 liter/hectare) each, provided 54% control of creeping bentgrass with minimal negative effects on overall turfgrass quality. In addition, ≥93% control of creeping bentgrass may be obtained at rates as low as 4 or 6 ounces/acre (0.30 or 0.45 liter/hectare) if multiple applications are made at two-week



Field turf quality

Tenacity (ounces/acre)	Overall quality of one application *						Overall quality of two applications*			
	Weeks after application						Weeks after final application			
	2	3	4	5	6	7	2	4	6	8
0	9 ab [†]	9 a	9 a	9 a	9 a	9 a	9 a	9 a	9 a	9 a
2	9 a	9 a	9 a	9 a	9 a	9 a	7 b	9 a	9 a	9 a
4	8 b	9 a	9 a	9 a	9 a	9 a	6 c	9 a	9 a	9 a
8	6 c	7 b	8 b	9 a	9 a	9 a	5 d	8 b	9 a	9 a
16	6 c	6 c	7 c	8 b	9 a	9 a	4 e	7 c	9 a	9 a
24	5 d	5 d	6 d	8 b	9 a	9 a	4 e	7 c	9 a	9 a
32	4 e	4 e	5 e	7 c	8 b	9 a	4 e	6 d	8 b	9 a

The first application occurred on May 5, 2004, and plots that received two applications were treated again on June 17, 2004. Plots were irrigated daily and fertilized with urea (46-0-0, N-P-K) at 1 pound nitrogen/1,000 square feet (48 kilograms/hectare) nitrogen on May 24, 2004. Values represent means of three replications. *Overall quality, based on color, uniformity and plant density, was assessed visually on a scale of 1 to 9, where 1 is the worst, 6 is acceptable and 9 is the best.

[†]Means within columns followed by the same letter are not significantly different from each other.

Table 2. Tenacity rate and number of applications affect turfgrass quality in the field.



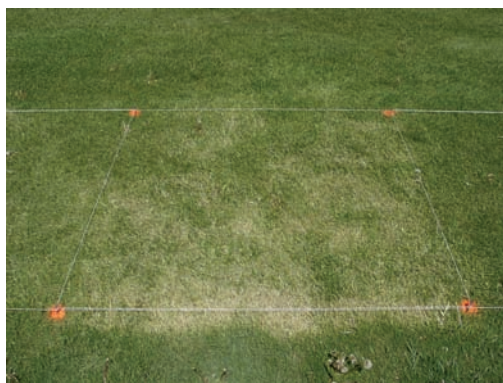
The research says

→ Repeat applications are necessary for long-term control of creeping bentgrass.

→ Application interval (two to three weeks) is just as important as the application rates.

→ Gaps present in the canopy after the creeping bentgrass died reduced overall turfgrass quality, and reseeding cool-season grasses may be necessary.

→ Tenacity is safe on Kentucky bluegrass and can be used to selectively control creeping bentgrass without damaging Kentucky bluegrass.



Two weeks after being treated with Tenacity at a rate of 32 ounces/acre (2.4 liters/hectare), this plot shows bleaching of the creeping bentgrass.

intervals. These data demonstrate the capability of Tenacity to provide effective post-emergence control of creeping bentgrass. Tenacity presents superintendents with the opportunity for selective removal of creeping bentgrass in Kentucky bluegrass and other cool-season turfgrass species.

Acknowledgments

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