Annual Bluegrass Control in Creeping Bentgrass Putting Greens

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Annual bluegrass control with cumyluron at Bella Vista, Ark.

Summary. Annual bluegrass is the most problematic weed in creeping bentgrass putting greens around the world. Three different studies were conducted over a three year period to evaluate the effectiveness of cumyluron as a postemergence control option for annual bluegrass and to evaluate any bentgrass injury caused from herbicide applications. Studies were conducted at Pinnacle Country Club in Rogers, Ark. and The Brittney Golf Course in Bella Vista, Ark. All treatments in all studies were broadcast applied using a CO_2-propelled sprayer. In the first two trials, results varied and, although annual bluegrass populations were reduced, treatments were not significantly different from the controls. In the third trial, cumyluron significantly reduced annual bluegrass populations compared to the control. The higher applications rates resulted in almost complete removal of the annual bluegrass from creeping bentgrass putting green turf.

Abbreviations: GPA, gallons per acre

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Annual bluegrass (*Poa annua*) is the most problematic winter weed in creeping bentgrass (*Agrostis stoloniferia*) putting greens (Beard, 1973). Its ability to grow and reproduce at a rapid rate and under varying conditions makes it very difficult to control. Annual bluegrass has the ability to grow and thrive in almost any condition whether it be compacted, dry, or under close mowing, as seen on golf putting greens (Beard et al., 1978; Lush, 1989; Sweeney and Danneberger, 1997). Annual bluegrass is often yellow-green in color and can lead to a mottled look when growing amongst a darker green grass such as creeping bentgrass (Lycan and Hart, 2006). Annual bluegrass is also undesirable because it is very coarse textured and can produce numerous seed heads which can affect playability of golf greens (Engel and Ilnicki, 1969; McCarty, 1999).

Annual bluegrass germinates during the fall and again during the spring when temperatures are in the mid-70s during the day and the mid-50s at night (McCarty, 1999). There are also two types of annual bluegrass found in putting greens, including an annual type and a type that behaves as a perennial. The annual type has the ability to produce as many as 2,200 seeds per plant during the growing season, and this contributes to the difficulty in controlling the weed since there are so many seeds in the soil. The perennial type produces less seed, but has more of a prostrate growth habit and can thrive under extremely low mowing heights (McCarty, 1999).

Control of annual bluegrass often includes a range of cultural and chemical approaches. In recent years, turf managers have been effectively using plant growth regulators such as paclobutrazol (Trimmit) to give bentgrass a competitive advantage over annual bluegrass (McCarty, 2005 and Murphy, 2005). However, these approaches are inconsistent and very rarely provide complete control of annual bluegrass. The objective of this research was to evaluate the effectiveness of cumyluron, a substituted urea herbicide under development by Helena Chemical Co, Colliver, Tenn. (Calhoun and Hathaway, 2009), for annual bluegrass control in creeping bentgrass putting greens.

Materials and Methods

All trials were conducted on creeping bentgrass putting greens in Northwest Arkansas. Each trial received treatments in both the fall and spring (Table 1). Prior to initiation of treatments, annual bluegrass populations were determined for each plot using a line intersect grid. Each grid was randomly thrown twice in each plot and intersects were counted and averaged to determine an existing population. All herbicide treatments were applied using a CO_2-propelled sprayer and a 5 ft. spray boom. Plot size was 5 ft by 10 ft. Plots were rated for percent injury at 3 days following herbicide application and percentage annual bluegrass was rated in each plot at several dates following treatment. All studies were arranged in a randomized complete block design.

The first trial was conducted on a practice green at Pinnacle Country Club in Rogers, Ark. Three different rates of cumyluron were sprayed in this trial, including 0.75, 1.5, and 2.25 oz a.i./1000 ft^2. All treatments were applied at a spray volume of 66 gpa (Table 1). For all treatments rates, a second set of treatments were combined with an adjuvant, HM0716 (Helena Chemical Co.), at a rate of 0.25% v/v. Finally all three treatment rates were also replicated in plots in which irrigation was applied immediately following herbicide application at a rate of 0.25 inch using a pre-measured volume of water and a watering can. Treatments were applied in fall 2007 and spring 2008.

The second trial was conducted at The Brittney Golf Course (Hole #7) in Bella Vista, Ark. The duration of this trial was from spring 2008 to spring 2009 and included three treatment application dates. This trial used the same rates of cumyluron as the trial at Pinnacle C.C. As in the previous study, existing bluegrass populations were determined using the line intersect grid prior to treatment application. Treatments were applied at a spray volume of 96 gpa with half the plots receiving irrigation immediately following herbicide applications. Irrigation was applied at a rate of 0.25 inch using a watering can and a predetermined volume of water.

The third trial was also conducted on the The Brittney Golf Course (Hole #6). Treatments were applied at a spray volume of 45 gpa. In this trial three different rates of two different formulations of cumyluron were applied in the fall of 2008 and the spring of 2009. Annual bluegrass populations were calculated in the same method as in the previous two trials. Phytotoxicity ratings were taken three days after treatment and bluegrass populations were determined three times following treatment applications.

Results and Discussion

There was no injury to the creeping bentgrass following any application of treatments in any of the three trials (data not shown). In the first trial at Pinnacle C.C., annual bluegrass populations slightly declined across the whole plot area in the first 6 months after treatments were initiated, but no differences between treatments were significant (Table 2). This trend continued until the spring of 2008 where on 29 May we observed a significant reduction in annual bluegrass from several treatments. The 1.50 oz + surfactant and all 2.25-oz treatments had significantly less annual bluegrass than the untreated control. Bluegrass populations continued to fall through the summer and there were no treatment effects observed on 15 August 2008, but this can be attributed to summer heat and normal bluegrass growth patterns. In the fall of 2008, the study was concluded at this site because the green was destroyed for renovation.

In the second trial there were no significant differences between any of the treatments and the untreated check on any of the rating dates (data not shown). Annual bluegrass populations were maintained at around 25% throughout the study. Again, there was no phytotoxicity observed with any of the treatments (data not shown).

The third trial provided the most significant treatment effects of all trials. This green was the most infested with annual bluegrass and had annual bluegrass populations between 60-75% prior to treatment applications (Table 3). At approximately 5 months after the first treatment application, there were significant decreases in all cumyluron-treated plots compared to the untreated check (Table 3, Fig. 1). The higher two rates of cumyluron decreased the annual bluegrass population from approximately 60% to less than 5% with a single application (Table 3). Following the second application date, the 1.5- and 2.25-oz treatments were significantly better than the 0.75-oz treatment in reducing annual bluegrass populations. Our results with this new herbicide are similar to those seen at Michigan State in 2007 (Calhoun, 2009) where they also observed better annual bluegrass control when the herbicide rates were increased.

Conclusions

Since the results varied between studies, it is premature to make firm recommendations regarding the effectiveness of cumyluron for annual bluegrass control. However, control of annual bluegrass using most postemergence herbicides has been unreliable at best (McCarty, 1999). Factors such as timing, temperature, tank mixes, and irrigation may play some role in the efficacy of cumyluron in the control of annual bluegrass. We did see in our third trial that population reductions were possible, which may have been an effect of the particular subspecies of annual bluegrass that was present on that green and/or herbicide rate or formulation (McCarty, 1999). Finally, one consistent observation in these trials was that no phytotoxicity was ever observed with these treatments, suggesting that cumyluron has a high degree of safety on creeping bentgrass.

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Table 1. Treatments for various cumyluron trials conducted over the past three growing seasons.

Treatment	Rate	Surfactant	Irrigation	Application dates			
	oz. a.i./1000 ft^2	0.25% v/v	0.25 inch	Fall 2007	Spring 2008	Fall 2008	Spring 2009
Pinnacle CC							
Untreated check				x	x		
HM9930	0.75			x	x		
HM9930	0.75	X		x	x		
HM9930	0.75		X	x	x		
HM9930	1.50			x	x		
HM9930	1.50	X		x	x		
HM9930	1.50		X	x	x		
HM9930	2.25			x	x		
HM9930	2.25	X		x	x		
HM9930	2.25		X	x	x		
Bella Vista #6							
Untreated check					x	x	x
HM9930	0.75				x	x	x
HM9930	0.75		X		x	x	x
HM9930	1.50				x	x	x
HM9930	1.50		X		x	x	x
HM9930	2.25				x	x	x
HM9930	2.25		X		x	x	x
Bella Vista #7							
Untreated check						x	x
HM9930	0.75					x	x
HM9930	1.50					x	x
HM9930	2.25					x	x
HM0814	0.75					x	x
HM0814	1.50					x	x
HM0814	2.25					x	x

Table 2. *Poa annua* incidence at Pinnacle Country Club, as affected by various cumyluron treatments.

Treatment	Rate	Surfactant	Irrigation	9/28/07	11/28/07	2/27/08	5/29/08	8/15/08
	oz a.i./1000 ft^2	0.25 % v/v	0.25"	------------------------ Poa annua (%) ------------------------				
Untreated check				27	15	18	28ab ^{z}	8
HM9930	0.75			38	25	20	32a	7
HM9930	0.75	X		32	24	12	16cde	8
HM9930	0.75		X	24	25	14	19bcd	4
HM9930	1.50			32	30	13	19bcd	11
HM9930	1.50	X		30	25	14	11de	5
HM9930	1.50		X	32	27	23	23abc	10
HM9930	2.25			26	18	13	13cde	8
HM9930	2.25	X		24	26	15	14cde	5
HM9930	2.25		X	17	27	7	8e	7
LSD (P=0.05)				ns ^{y}	ns	ns	10	ns

^{z} means followed by different letters are significantly different at the 0.05 level of probability.
^{y} ns – not significantly different.

Table 3. *Poa annua* incidence at Brittney Golf Course (Hole #6), as affected by various cumyluron treatments.

Treatment	Rate	9/25/09	2/6/09	4/2/09
	oz a.i./1000 ft^2		*Poa annua* (%)	
Untreated check		75	63 a ^{z}	81 a
HM9930	0.75	66	25 b	24 b
HM9930	1.50	64	3 b	6 c
HM9930	2.25	64	2 b	3 c
HM0814	0.75	63	16 b	19 b
HM0814	1.50	59	2 b	5 c
HM0814	2.25	61	1 b	4 c
LSD (P=0.05)		ns ^{y}	19	8

^{z} means followed by different letters are significantly different at the 0.05 level of probability.
^{y} ns – not significantly different.

Fig. 1. Image of untreated check plot on 27 March 2009 at Bella Vista, Ark. Notice reduction in *Poa annua* in both treated plots on each side of check.