Stop #8c: Evaluation of Herbicides and Plant Growth Regulators (PGRs) for Annual Bluegrass Control in Creeping Bentgrass Putting Greens in Southern California

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Objectives:

This study was conducted to evaluate various rates and formulations of several herbicides and plant growth regulators (PGRs) to control annual bluegrass (*Poa annua*) in creeping bentgrass (*Agrostis stolonifera*) maintained as a golf course putting green in Southern California.

Materials and methods:

The study was conducted on a practice green at Bel-Air Country Club in Los Angeles, CA. The green was mature creeping bentgrass (*Agrostis stolonifera*) 'Pure Distinction' on a sand-based rootzone. Target weed was annual bluegrass (*Poa annua*). Total of 16 herbicide and plant growth regulators (PGRs) treatments (including untreated control) were applied as described in Table 1 starting on May 1, 2017. Treatments were applied with CO_2-powered backpack sprayer equipped with TeeJet 8004VS nozzles and calibrated to deliver 2 gallons/1000 ft^2. The green was irrigated with 0.1-0.2 inches of water immediately following each application. Experimental design was a complete randomized block with 4 replications. Plot size was 4×6 ft with 2-ft alleys. Plots were evaluated biweekly for annual bluegrass cover (0-100 %), turfgrass injury (0-100%) caused by treatments, and green color (1-9; 9=darkest) starting from May 1, 2017.

Results:

No statistical differences were found between untreated control and other treatments during first seven rating events in 2017 in terms of *P. annua* cover except for June 12 and July 24 when PoaCure EC at 0.3% v/v applied with Weed Wand applicator caused a significant decrease in target weed cover. Also, weed cover in this treatment persisted in the lowest level among all treatments until April 2, 2018 (data not shown). Beginning August 7, 2017, PoaCure EC at 0.6 and 1.2 oz/M, together with Musketeer at 15 oz/A and Trimmit at 8 oz/A decreased *P. annua* cover when compared to control. However, starting from August 21, 2017 until the most recent rating date, all PoaCure treatments significantly reduced annual bluegrass cover in comparison to untreated control even though no PoaCure applications were made in 2018. In general, PGRs showed very good *P. annua* suppression when compared to control, but starting on January 16, 2018 control with PGRs was not as effective as with PoaCure or HM-0814 treatments at 3 oz/M and 6 oz/M, which started showing significant weed control effects beginning October 30, 2017 (Fig. 1).

No significant turfgrass injury was shown with any rate of PoaCure EC until October 30, following re-application in the fall. It is important to note that re-application of PoaCure in the same calendar year was neither needed nor recommended according to the label. Following repeat applications in the fall, injury symptoms mounted, especially at higher rates, until the point where the damage caused was severe. However, in spring of 2018 plots showed rapid recovery from injury with PoaCure, which lead not only to full turf recovery demonstrated on May 14, 2018 (Fig. 2), but also increased turf quality (data not shown). HM-0814 treatments started showing significant injury on June 24, 2017 at 3 and 6 oz/M, and again on October 16, 2017 and persisting until April 2, 2018. Besides thinning, HM-0814 caused discoloration best described as 'coffee staining' on the foliage. Those symptoms persisted until December 11 and reappeared after spring application in 2018. In the winter, those plots were slightly lime green in color. Injury caused by PGRs was first seen May 30, 2017 and increased with time until November 27, when turf started to recover. With reapplication of PGRs in 2018 injury also reappeared and mounted. The highest level of injury among PGRs so far was caused by Cutless at 24.6 oz/M, with the highest injury peak on November 27, 2017, but even the 1/2x rate caused significant injury. At the same time, there was no PGR treatment causing injury below 25%. PGR treatments also caused turf darkening which was more permanent than discoloration caused by HM-0814 (data not shown).

Best performance in terms of *P. annua* suppression among PGRs was seen with Trimmit at 8 oz/A and Musketeer at 15 oz/A, which was comparable to PoaCure EC at 0.3 oz/M, until January 16, 2018, when Poa infestation started becoming more pronounced than in 2017 season. Both PGR treatments caused injury (Fig. 2), symptoms of which increased over time, as well as significant turf darkening which may be desirable on putting greens (data not shown).

PoaCure didn't show any undesirable effects until fall 2017 re-application when recommended rates were doubled (0.6 oz/M applied 6 times in spring and re-applied 6 times in fall; 1.2 oz/M applied 3 times in spring and re-applied 3 times in fall) totaling 7.2 oz/M. Re-application of PoaCure in such a short time interval was not necessary in this study and is not prescribed on the label. Rather, we wanted to determine the effects of over application on weed control and bentgrass safety (Fig. 2). Considering this fact and persisting annual bluegrass control at the highest level without 2018 reapplication, PoaCure has provided the best overall combination of Poa control and bentgrass safety among all treatments evaluated.

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Table 1. Treatments evaluated for annual bluegrass (Poa annua) control and application timing. Bel-Air CC, Los Angeles, CA, 2017-18.

No.	Treatment	Active ingredient	Company	Rate	Frequency (wks)	Number of applications	Timing*
1	Untreated Control	-	-	-	-	-	-
2	PoaCure EC	methiozolin	Moghu	0.3 oz/M	2	6; 6 (12)	A-F; L-R***
3	PoaCure EC	methiozolin	Moghu	0.6 oz/M	2	6; 6 (12)	A-F; L-R***
4	PoaCure EC	methiozolin	Moghu	1.2 oz/M	2	3; 3 (6)	A-C; L-N***
5	PoaCure EC	methiozolin	Moghu	0.3% v/v	2	6; 6 (12)	A-F; L-R***
6	HM-0814	cumyluron	Helena	1.5 oz/M	4	2; 2 (4)	A, C; L, N
7	HM-0814	cumyluron	Helena	3 oz/M	4	2; 2 (4)	A, C; L, N
8	HM-0814	cumyluron	Helena	6 oz/M	4	2; 2 (4)	A, C; L, N
9	Cutless	flurprimidol	SePRO	6.1 oz/A	2	15	A-O
10	Cutless	flurprimidol	SePRO	15 oz/A	2	15	A-O
11	Cutless	flurprimidol	SePRO	24.6 oz/A	2	15	A-O
12	Legacy	flurprimidol, trinexapac-ethyl	SePRO	10 oz/A	2	15	A-O
13	Musketeer	flurprimidol, paclobutrazol, trinexapac-ethyl	SePRO	15 oz/A	2	15	A-O
14	Trimmit	paclobutrazol	Syngenta	4 oz/A	2	15	A-O
15	Trimmit	paclobutrazol	Syngenta	6 oz/A	2	15	A-O
16	Trimmit	paclobutrazol	Syngenta	8 oz/A	2	15	A-O

**Treatment No. 5 applied using Weed Wand applicator.

***PoaCure treatments (No. 2 to 5) were not applied in 2018 season.

***Timing:**

A	5/1/2017	4/30/2018
B	5/15/2017	5/14/2018
C	5/30/2017	5/29/2018
D	6/12/2017	6/11/2018
E	6/26/2017	6/25/2018
F	7/10/2017	7/9/2018
G	7/24/2017	7/23/2018
H	8/7/2017	8/6/2018
I	8/21/2017	8/20/2018
J	9/5/2017	9/4/2018
K	9/18/2017	9/17/2018
L	10/2/2017	10/1/2018
M	10/16/2017	10/15/2018
N	10/30/2017	10/29/2018
O	11/13/2017	11/12/2018
P	11/27/2017	
R	12/11/2017	

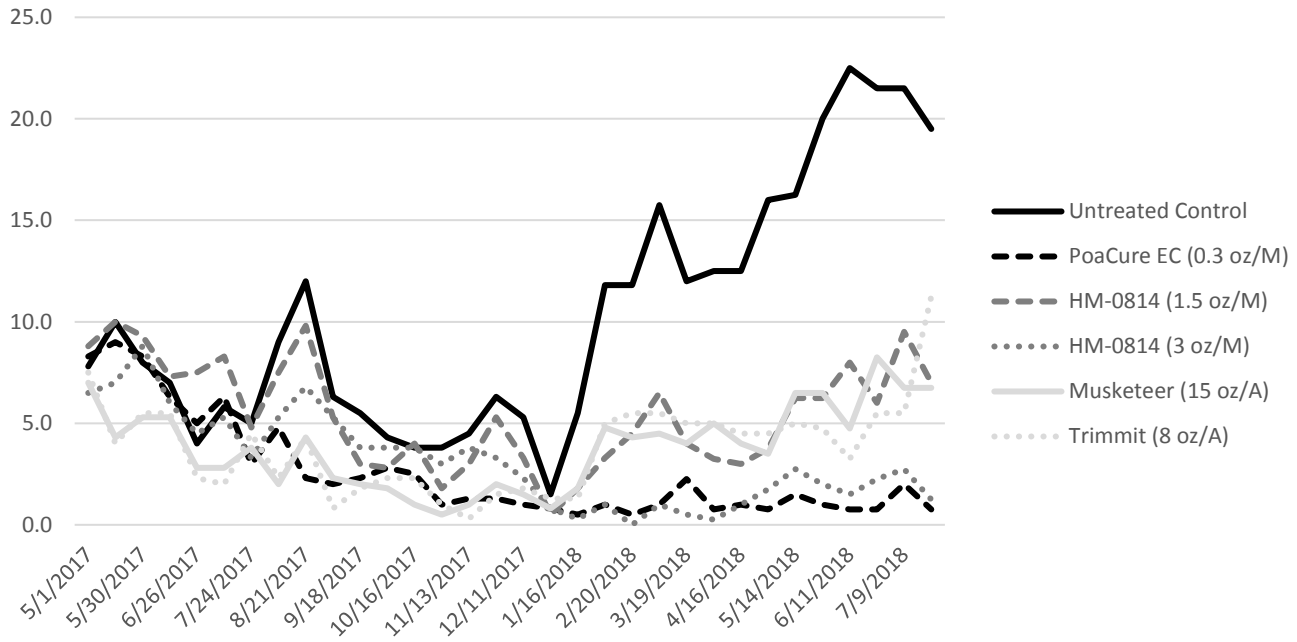

Figure 1. Effect of chosen herbicides and plant growth regulators (PGRs) on annual bluegrass cover (0-100%; y-axis). 2017-18. Bel-Air Country Club, Los Angeles, CA.

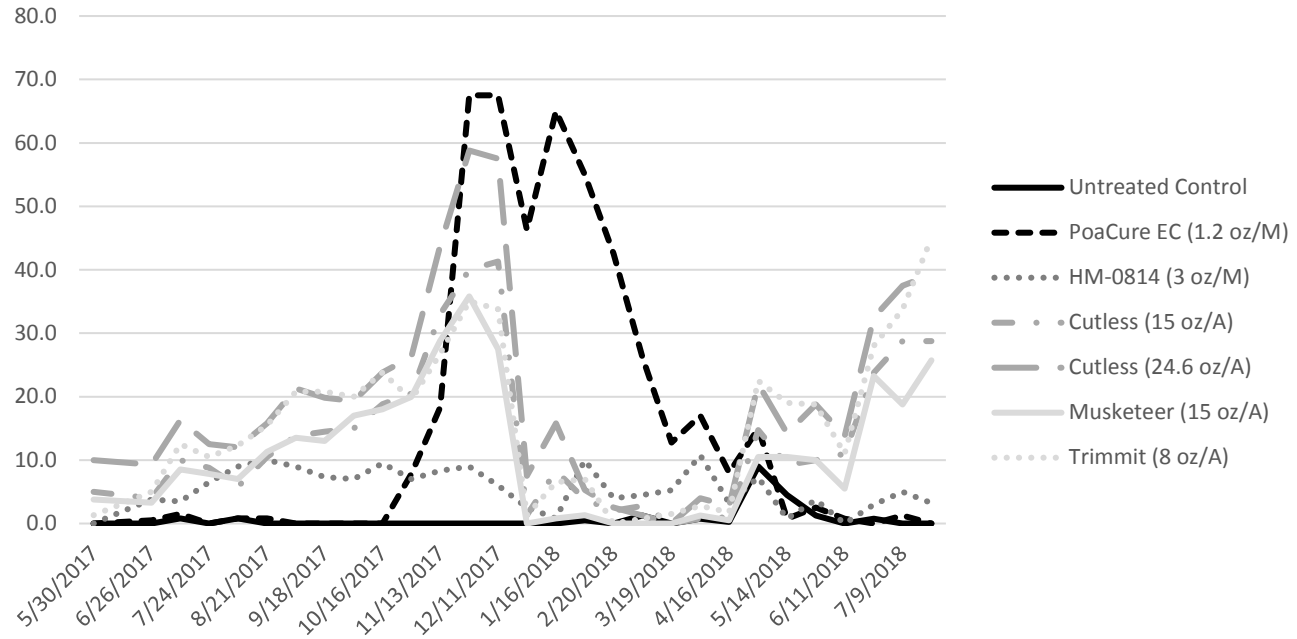

Figure 2. Effect of chosen herbicides and plant growth regulators (PGRs) on creeping bentgrass injury (0-100%; y-axis). 2017-18. Bel-Air Country Club, Los Angeles, CA.