

Non-Pesticide Methods to Reduce *Poa annua* on Creeping Bentgrass Putting Greens

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INTRODUCTION

- Annual bluegrass (*Poa annua* L.) is a grassy weed that affects the density, uniformity, smoothness, and ball roll distance on creeping bentgrass (*Agrostis stolonifera* L.) putting greens.
- There are restrictions on the availability of chemicals worldwide and high standards demanded on putting greens.
- The purpose of this study was to determine if non-pesticide methods could reduce *Poa annua* on a creeping bentgrass putting green.

OBJECTIVES

- To determine the effects of overseeding of '007XL' creeping bentgrass (*Agrostis stolonifera*) or 'Leeward' chewing fescue (*Festuca rubra ssp. commutata*) will have on reducing the germination of *Poa annua* on 'Pennncross' creeping bentgrass putting greens.
- To determine if brushing will cause mechanical damage to *Poa annua* seedlings and reduce infestation.
- To evaluate non-pesticide methods to reduce *Poa annua* infestation using either iron HEDTA or the plant growth regulator paclobutrazol.

METHODS

- Split-split plot design field study established on a 'Pennncross' creeping bentgrass putting green on native soil at the Ohio Turfgrass Foundation Research and Education Facility, Columbus, OH (Fig. 1).
- 12 individual plots consist of 4 replications (Fig. 1).



Figure 1. Split-split plot randomized design field study. Labeling of Rep 1. Overseeding plots: 007XL (A), Leeward (B), and check plot (C). Subplots: brushed (blue), no brushing (yellow). Sub-sub-plot treatments: control (1), paclobutrazol (2), iron HEDTA (3).

Overseeding

Applied with a Vredi Turf Buddy Slit seeder (DZ5, Vredi, Netherlands) (Fig. 2A).

- 007XL and Leeward on 18 September 2023.
- Second overseeding with 007XL and Leeward on 9 October 2023.

Brushing

Jacobsen Ellipse 2 walk-behind reel greens mower (Textron Specialized Vehicles, Ipswich, England) with a front brush attachment set at zero mm (Fig. 2B).

- Brushing treatments applied from 18 September 2023 to 1 November 2023 (6 weeks).
- Brushing treatment applied 3 days week⁻¹ (Monday, Wednesday, and Friday).

Treatments

Applied using carbon dioxide (CO₂) powered backpack sprayer equipped with two flat-fan spray tips (8004VS VisiFlo, TeeJet Technologies, Wheaton, IL) and calibrated to deliver 0.0815 Lm⁻² spray solution.

- Fiesta (iron HEDTA, Neudorff, North America) and Trimmit SC (paclobutrazol, Syngenta) were applied 3 times at 3-week intervals (13 September, 5 October and 30 October 2023).

Maintenance

- Jacobsen Ellipse 2 walk-behind reel greens.
 - Plots were mowed 5-6 times per week at 3mm.
 - Mowing was decreased during the winter months (late November through April) or when heavy rainfall occurred.
- Irrigated twice daily from April to October. Hand watering conducted as needed to prevent wilting.
- Fertilizer with micronutrients (48-0-0 with micros, The Andersons) were applied per soil test recommendations.
- Preventative pesticide applications
 - Fungicide: Interface (iprodione, trifloxystrobin, Bayer), Lexicon (fluxapyroxad + pyraclostrobin, BASF), Secure (fluazinam, Syngenta), Xzemplar (fluxapyroxad, BASF), CLT 720 (chlorothalonil, Armor Tech) and Maxtima (mefentrifluconazole, BASF).
 - Insecticide: Scimitar GC (lambda-cyhalothrin, Syngenta), Aceleprn Xtra (chlorantraniliprole + thiamethoxan, Syngenta).



Figure 2. Vredo Turf Buddy Slit seeder (A), Brushing unit (B) attachment on walk mower.

Measurements

- Quality was assessed visually on the 1-9 NTEP scale weekly during 2023, 2024. (where 9 = darkest shade of green color, 6 = minimum acceptable green color level and 1 = dead).
- Density was assessed visually on a 1-10 scale (where 0 represents bare soil and 10 represents dense turfgrass).
- Poa annua* percent cover was assessed visually.
- Poa annua* cover was assessed using a 10 x 10 grid box and where *Poa* was at an intersection it was counted.
- Each measurement will be taken biweekly for 2 years from September 2023 to May 2025 with no evaluation conducted through the non-growing season (December to end of March).

STATISTICS

- Analyzed as a split-split plot randomized design with repeated measures using SAS 9.4 Proc GLM.
- Years analyzed separately.

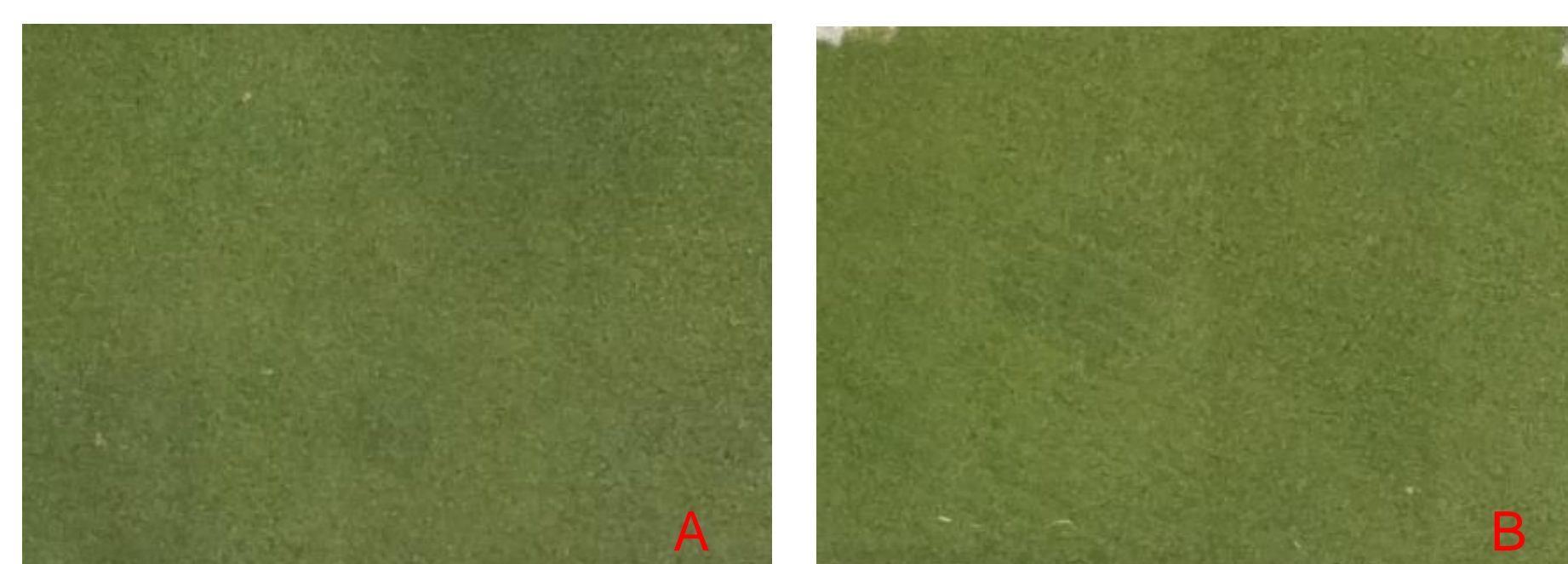


Figure 3. Overseeding effects after 14 days using Leeward (A) and 007XL (B).

RESULTS

- The germination period for Leeward was notably longer when compared to the 007XL (Fig. 3).
- Overseeded 007XL exhibits a more pronounced coloration in comparison to Leeward (Fig. 3).
- The interactions between overseeding, brushing, and treatments on *Poa* cover over time are shown in Table 1.

Table 1: Summary ANOVA for quality, density, *Poa*, and *PoaGrid* count on a creeping bentgrass putting green in 2024.

	Quality	Density	<i>Poa</i>	<i>PoaGrid</i>
	Pr > F			
Rep (R)	0.5791	0.0343	0.0199	0.0457
Species (S)	0.4145	0.1478	0.1246	0.1470
R x S (Error a)				
Brush (B)	0.3638	0.0591	0.6161	0.1615
S x B	0.3496	0.3361	0.1540	0.1663
R x S x B (Error b)				
Treatment (trt)	0.3750	0.3537	0.3123	0.0811
S x trt	0.4039	0.3114	0.9404	0.6464
B x trt	0.3085	0.2794	0.6743	0.9245
S x B x trt	0.4792	0.2211	0.4661	0.6714
R x S x B x trt (Error c)				
Date (D)	<0.0001	<0.0001	<0.0001	<0.0001
D x R	0.5611	0.7155	0.5151	0.9630
D x S	0.3637	0.9347	0.0017	0.0201
D x R x S (Error d)				
D x B	0.4848	0.0009	0.4010	0.7533
D x S x B	0.4932	0.7476	0.1716	0.6583
D x R x S x B (Error e)				
D x trt	0.4934	0.2091	<0.0001	0.5040
D x S x trt	0.4857	0.0013	0.4199	0.0153
D x B x trt	0.5014	0.8527	0.2475	0.0011
D x S x B x trt	0.5057	0.9626	0.9698	0.8145

- No main effect differences were observed (Fig. 4).
- An interaction over time was observed with brushing and the treatments (iron HEDTA (Fe) or paclobutrazol (PGR)) (Fig. 5). However, on each date, no differences in *PoaGrid* count were observed.
- An interaction over time was observed with overseeding (007XL or Leeward) and the treatments. However, on each date, no differences in *PoaGrid* count were observed (Fig. 6).
- Poa* count decreased in the middle of summer and this remained consistent for the remainder of the year.
- An interaction over time was observed with overseeding and the treatments. However, on each date, no differences in 'Pennncross' creeping bentgrass density were observed (Fig. 7).

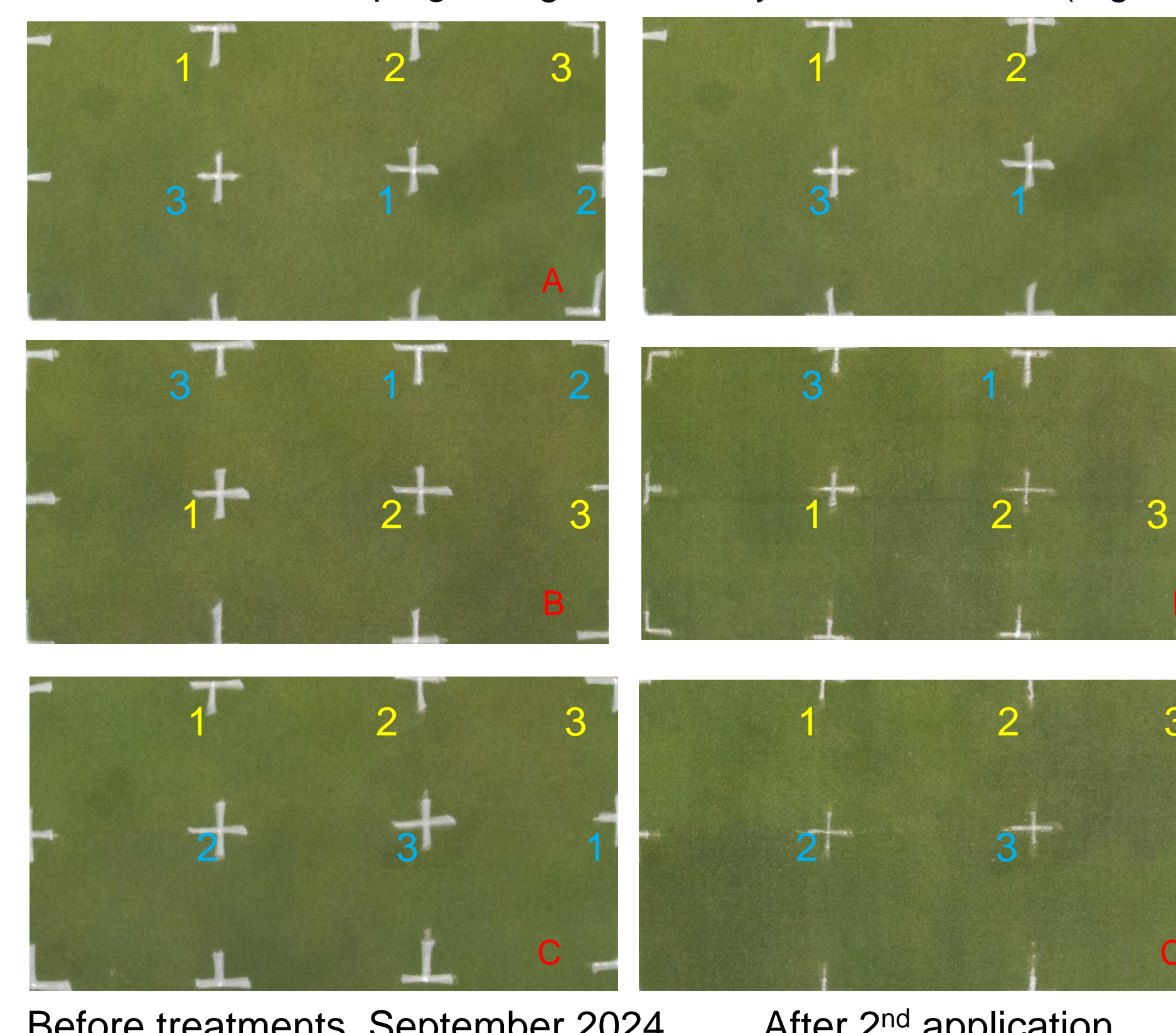


Figure 4. Effect of overseeding, brushing, and treatments after 2 applications in September 2024. Overseeding plots: 007XL (A), Leeward (B) and check plot (C). Subplots: brushed (blue), no brushing (yellow). Sub-sub-plot treatments: control (1), paclobutrazol (2), iron HEDTA (3).

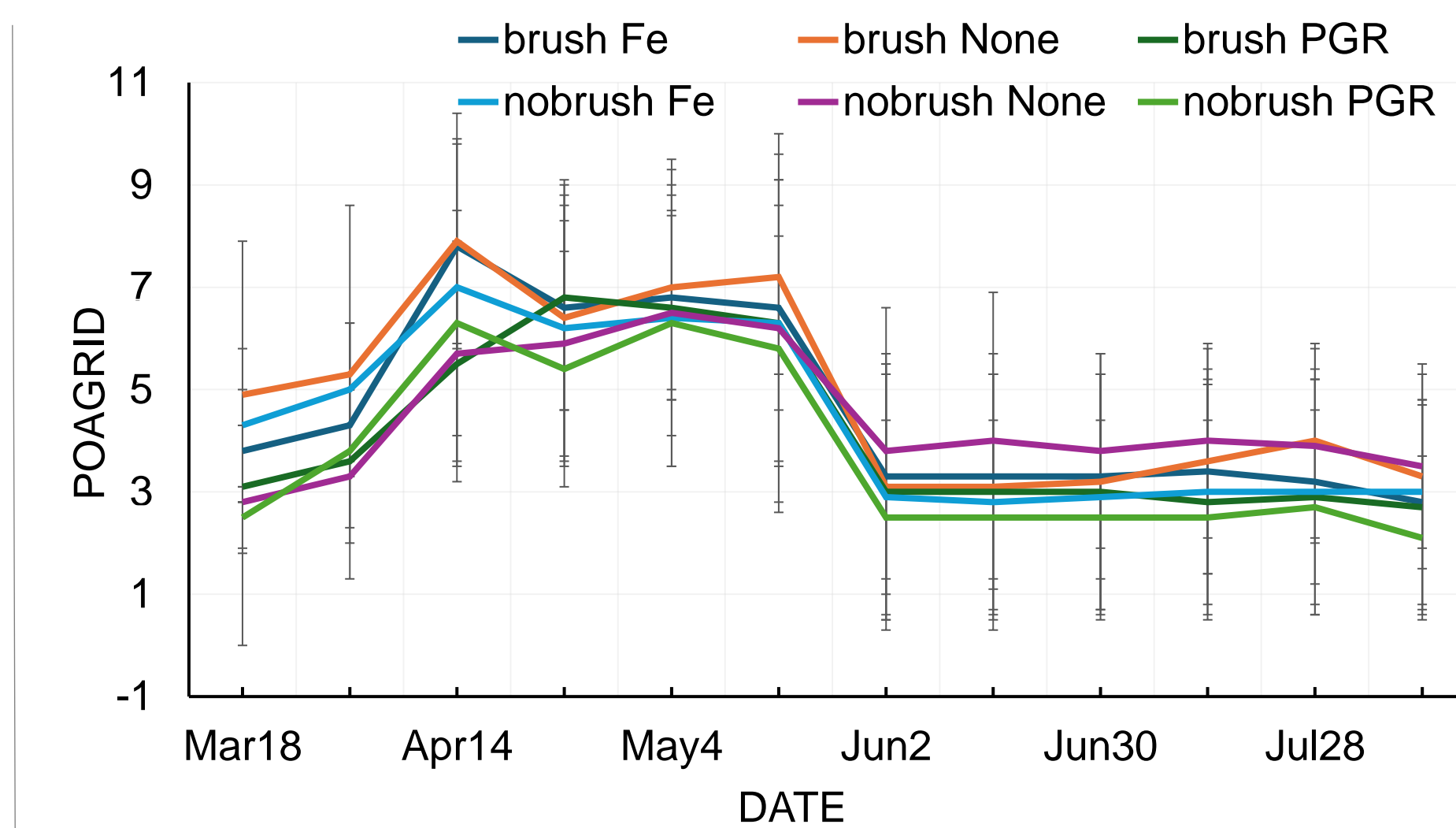


Figure 5: Changes in *PoaGrid* count over time to brushing or application of iron HEDTA (Fe) or paclobutrazol (PGR). Vertical lines denote standard error.

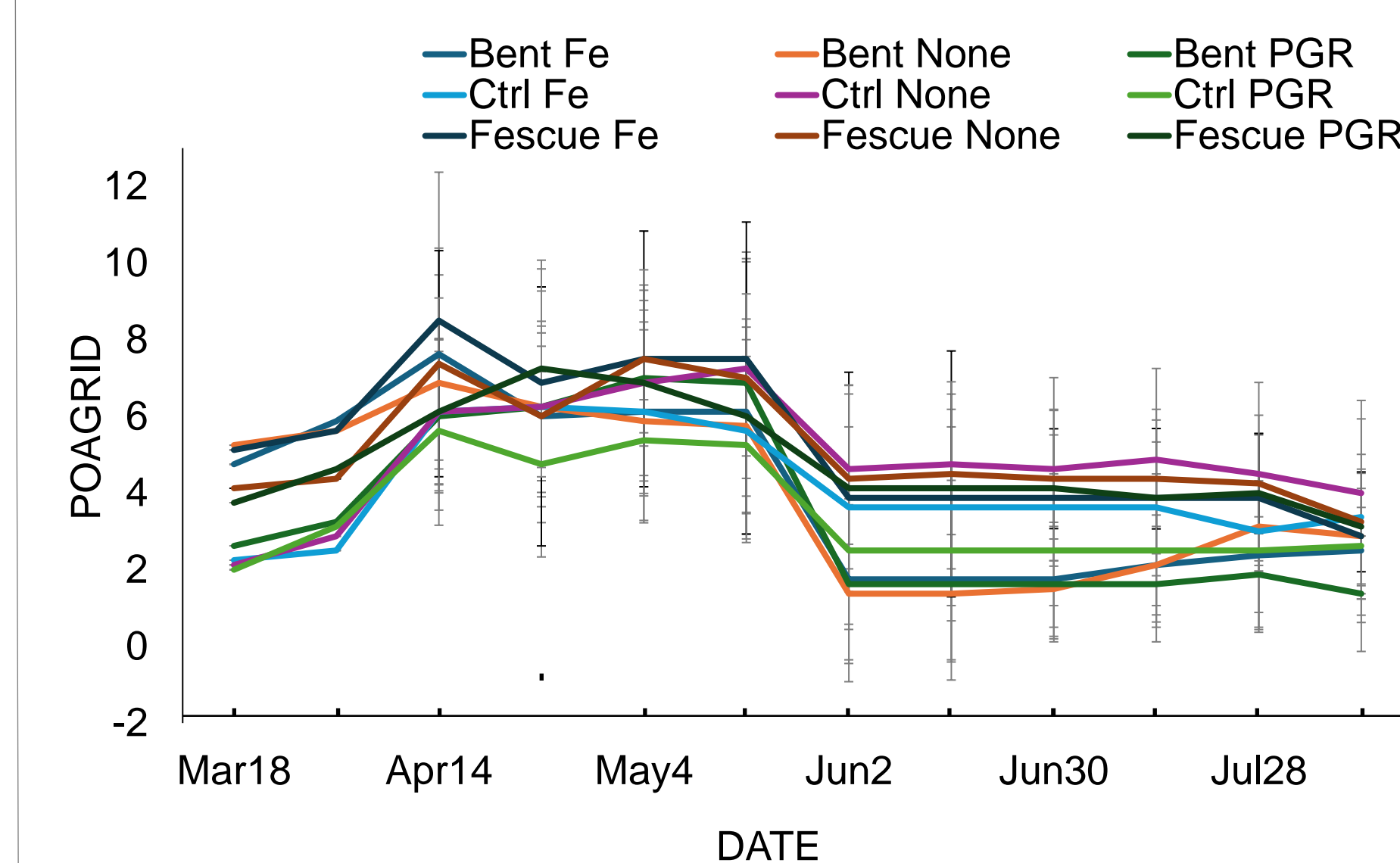


Figure 6: Changes in *PoaGrid* count over time due to overseeding 007XL (Bent) or Leeward (Fescue) and applications of iron HEDTA (Fe) or paclobutrazol (PGR). Vertical lines denote standard error.

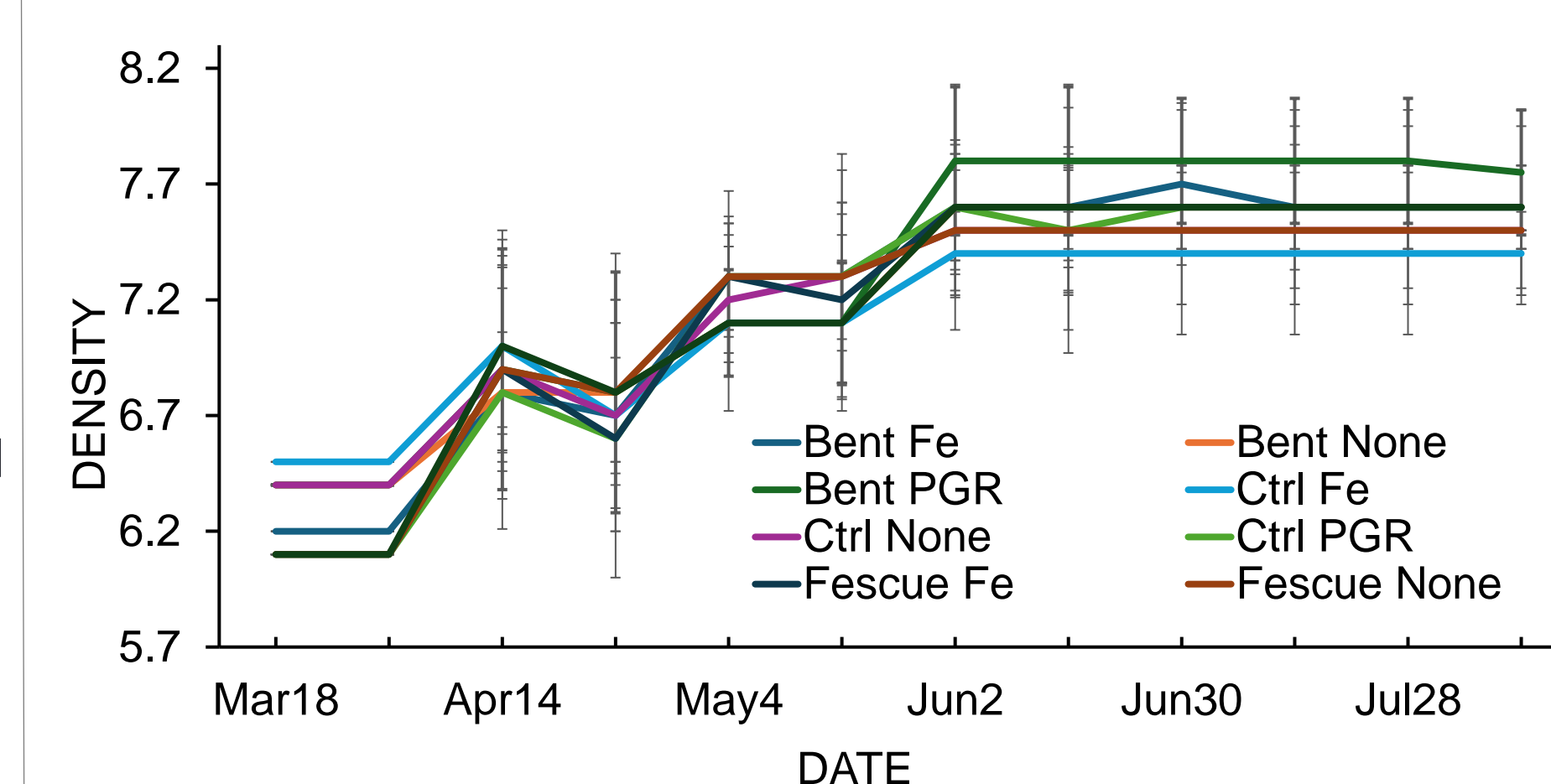


Figure 7: Changes in creeping bentgrass density over time due to overseeding 007XL (Bent) or Leeward (Fescue) and applications of iron HEDTA (Fe) or paclobutrazol (PGR). Vertical Line denotes standard error.

INITIAL CONCLUSIONS

- After the first year, we did not observe differences in *Poa annua* cover due to overseeding (007XL or Leeward), brushing, or the treatments (iron HEDTA (Fe) or paclobutrazol (PGR)).
- During the second year, it is expected that some potential variances will start to appear, indicating a delayed effect of the treatments.

ACKNOWLEDGEMENTS

This project wouldn't be possible without support from:

OSU Waterman Farm Staff
Gina Zirkle, Syngenta
Leah Brillman, DLF Seed Research of Oregon
Andrew Northeim, Columbus Crew