Efficacy of experimental plant growth regulator on biomass growth reduction and crop tolerance in creeping bentgrass fairway type turf – 2010 trial.

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The objective of this research project was

1. to evaluate an experimental PGR for reduction of grass biomass in comparison with an industry standard PGR in golf course turf (creeping bentgrass/*Poa annua* mixture at 9 mm fairway mowing height)

2. to determine appropriate rates for experimental PGR competitive to the industry standard rate and to evaluate crop safety on turf

Data collected included measurements of phytotoxicity 7 and 21 DAT, regular canopy reflectance data (NDVI and R/NIR indices) shoot dry matter accumulation to estimate grass biomass reduction (at mowing), turf quality, uniformity, and density, and resistance of the turf to disease and other stresses.

MATERIALS/METHODS

The trial involved established creeping bentgrass/annual bluegrass fairway type turf on sandy loam soil. Treatments consisted of the sponsor's product at several rates (Table 1) applied monthly beginning May 28, 2010. An untreated check as well as an industry standard treatment was also included. Treatments were applied to 1 x 2 m plots of turf maintained as appropriate on the sandy loam soil research ranges at the Guelph Turfgrass Institute (Figure 1). Management included twice weekly mowing at 9 mm, regular fertility, and irrigation to prevent stress. Treatments were replicated four times in a randomized complete block design. Treatments were applied in 5 applications (monthly May 28 - September 17). Treatments were applied with a compressed air sprayer (20 psi; 50 ml m-2 spray volume; TeeJet 8001VS flat fan nozzles). Plots were mowed as close as possible in time prior to application, but not closer than 1hour before application. Regular mowing frequencies between applications were roughly twice weekly.

Color response and general vigor of the turf was assessed using canopy reflectance (chlorophyll meter or Greenseeker NDVI and R/NIR). Uniformity of the color response was assessed visually. Plots were rated for turf quality, density and uniformity. Clippings were collected from a fixed area (0.8 m2) of each plot from regular mowings to determine shoot growth rates. An anecdotal photographic record of the experiment was kept.

All measurements were analyzed by appropriate statistical analyses (general linear models).

Table 1. Treatments

Treatment	Product	Product rate (mL 100 m^{-2})	Application volume
1	Untreated	—	—
2	LI6279	3.85	500 L ha^{-1}
3	LI6279	7.7	500 L ha^{-1}
4	LI6279	11.5	500 L ha^{-1}
5	LI6279	15.4	500 L ha^{-1}
6	LI6314	7.7	500 L ha^{-1}

All products applied monthly: May 28, June 25, July 22, August 20, and September 17, 2010.

Figure 1. Plot area in creeping bentgrass fairway turf on soil range, June 3, 2010.

RESULTS

Canopy reflectance and turf performance. There significant differences among treatments in canopy reflectance on all but one measurement date (Table 2). The absolute values of the NDVI differences, whether positive or negative, were too small to be significant to management (there were no differences in turf color or quality visible to a trained visual rater). Previous trials have shown a positive association between canopy reflectance and growth rate, but the absolute differences in NDVI are small.

Table 2. Canopy reflectance of treated plots.

Treatment	05/25	05/27	05/29	05/31 1 DAT	06/01 3	06/04 4	06/05 7	06/10 8	06/11 13	06/14 14	06/16 17	06/28 19	07/02 3 DAT	07/06 11
LI6279-15	0.613[1]	0.598	0.594	0.612	0.585	0.582	0.607	0.586	0.603	0.643	0.597	0.667	0.654	0.625
LI6279-12	0.625	0.602	0.608	0.624	0.593	0.596	0.615	0.605	0.615	0.653	0.606	0.682	0.642	0.638
LI6279-8	0.615	0.599	0.604	0.615	0.589	0.593	0.617	0.595	0.622	0.644	0.612	0.673	0.655	0.621
LI6279-4	0.605	0.595	0.592	0.596	0.578	0.576	0.596	0.573	0.592	0.622	0.586	0.665	0.629	0.631
LI6314	0.622	0.596	0.604	0.596	0.572	0.588	0.587	0.573	0.594	0.635	0.615	0.668	0.652	0.626
Untreated	0.608	0.606	0.608	0.612	0.587	0.595	0.609	0.579	0.596	0.633	0.591	0.659	0.651	0.620
LI6279-15	0.005[2]	-0.008	-0.014	0.000	-0.001	-0.013	-0.002	0.007	0.008	0.010	0.006	0.008	0.003	0.005
LI6279-12	0.016	-0.004	0.000	0.012	0.006	0.001	0.005	0.026	0.020	0.021	0.015	0.022	-0.009	0.018
LI6279-8	0.006	-0.007	-0.004	0.003	0.002	-0.002	0.007	0.016	0.027	0.011	0.021	0.014	0.004	0.002
LI6279-4	-0.003	-0.011	-0.015	-0.015	-0.009	-0.020	-0.014	-0.006	-0.003	-0.010	-0.004	0.006	-0.022	0.011
LI6314	0.014	-0.010	-0.004	-0.016	-0.015	-0.007	-0.022	-0.006	-0.002	0.002	0.025	0.009	0.001	0.006
msd p=0.05	0.010	0.009	0.008	0.011	0.008	0.006	0.009	0.008	0.011	0.011	0.011	0.008	0.011	0.006
Treatment	07/12 17	07/14 19	07/19 24	07/23 1 DAT	07/27 5	08/03 12	08/09 18	08/19 28	08/26 6 DAT	09/07 18	09/14 25	09/18 1 DAT	09/23 6	09/27 10
LI6279-15	0.615	0.605	0.582	0.581	0.662	0.633	0.665	0.647	0.667	0.646	0.625	0.676	0.665	0.677
LI6279-12	0.621	0.611	0.581	0.582	0.664	0.638	0.679	0.656	0.663	0.648	0.639	0.689	0.671	0.685
LI6279-8	0.610	0.607	0.579	0.574	0.661	0.632	0.672	0.648	0.666	0.651	0.631	0.682	0.668	0.678
LI6279-4	0.617	0.611	0.581	0.582	0.663	0.637	0.670	0.657	0.662	0.650	0.634	0.683	0.670	0.682
LI6314	0.610	0.621	0.601	0.592	0.668	0.641	0.683	0.663	0.662	0.657	0.651	0.700	0.672	0.684
Untreated	0.612	0.614	0.574	0.575	0.662	0.633	0.677	0.654	0.667	0.648	0.643	0.684	0.669	0.681
LI6279-15	0.003	-0.009	0.008	0.006	0.000	0.000	-0.012	-0.006	0.000	-0.002	-0.018	-0.008	-0.004	-0.004
LI6279-12	0.009	-0.002	0.007	0.006	0.001	0.004	0.002	0.002	-0.004	0.000	-0.004	0.005	0.001	0.004
LI6279-8	-0.002	-0.007	0.005	-0.001	-0.001	-0.001	-0.005	-0.006	-0.001	0.003	-0.012	-0.002	-0.001	-0.002
LI6279-4	0.005	-0.003	0.007	0.007	0.001	0.004	-0.006	0.004	-0.005	0.002	-0.009	-0.001	0.000	0.001
LI6314	-0.002	0.007	0.027	0.016	0.005	0.008	0.006	0.010	-0.005	0.009	0.008	0.016	0.002	0.004
msd p=0.05	0.007	0.008	0.007	0.006	0.005	0.004	0.005	0.005	0.004	0.005	0.007	0.004	0.005	0.005

[1] Normalized-difference vegetation index; means of 40-50 readings x 4 replicates.

[2] Normalized-difference vegetation index relative to untreated control (=0); means of 40-50 readings x 4 replicates.

Growth rate. Shoot growth as estimated by measurements of shoot dry matter accumulation showed very little consistent change in growth in the plots associated with any treatment (Table 3.) When there was a significant difference, none of the growth regulator treatments were different from the untreated control.

DISCUSSION AND CONCLUSIONS

No growth regulator treatments produced a consistent reduction in shoot tissue growth relative to the untreated check, and in fact on many dates the growth rate in treated plots was greater than in the untreated control. This differs from the previous year, when there were some slight decreases in growth detected in some treatments. None of the treatments had a negative effect on turf color or quality (assessed by canopy reflectance and visually).

Table 3. Shoot growth rate; dry mass of clippings collected from bentgrass turf mowed at 4 mm every 3-5 days.

Treatment	05/31	**06/15**	06/23	**07/02**	07/16	08/27
	3 DAT	**18 DAT**	26 DAT	**7 DAT**	21 DAT	7 DAT
LI6279-4	3.00	**1.95 ab**	1.55	**0.96 ab**	1.96	1.76
LI6279-8	3.41	**2.27 a**	1.77	**1.19 a**	2.16	1.75
LI6279-12	3.17	**2.18 ab**	1.98	**0.81 ab**	2.02	1.67
LI6279-15	3.23	**1.91 ab**	1.74	**0.88 ab**	1.92	1.47
LI6314	3.42	**1.57 b**	1.83	**0.49 b**	1.96	1.08
Untreated	3.19	**1.99 ab**	1.45	**0.73 ab**	1.72	1.31
LI6279-4	-0.20	**-0.04**	0.10	**0.24**	0.24	0.45
LI6279-8	0.21	**0.28**	0.31	**0.46**	0.44	0.43
LI6279-12	-0.02	**0.20**	0.52	**0.08**	0.30	0.36
LI6279-15	0.03	**-0.08**	0.29	**0.15**	0.20	0.16
LI6314	0.23	**-0.42**	0.37	**-0.24**	0.24	-0.23
msd p=0.05	NS	**0.64**	NS	**0.62**	NS	NS

[1] Shoot growth rate (g m^{-2} day^{-1}) from tissue collected; means of 4 replicates.
[2] Shoot growth rate (g m^{-2} day^{-1}) relative to untreated control (=0); means of 4 replicates. Means within columns followed by the same letter are not significantly different (Fisher's protected lsd, p=0.05)

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