

## Efficacy of experimental plant growth regulator on biomass growth reduction and crop tolerance in Kentucky bluegrass sod mixtures.

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The objective of this research project was:

1. to evaluate experimental PGR for reduction grass biomass reduction and compare with an industry standard PGR in Kentucky bluegrass sod mixtures (40 mm mowing height)
2. to determine appropriate rate for experimental PGR competitive to the industry standard rate and evaluate crop safety on turf

Only the standard LI6314 had a consistent reduction in growth rate compared to the control. Within the LI6279 treated plots there was no consistent rate effect, as higher rates sometimes produced larger growth rate reduction and sometimes smaller reduction than lower rates. None of the treatments had a negative effect on turf color or quality (assessed by canopy reflectance and visually).

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 Kentucky bluegrass sod mix turf on sandy loam soil. Treatments consisted of the sponsor's product at

several rates (Table 1) applied monthly beginning June 8, 2009. An untreated check as well as an industry standard treatment was also included. Treatments were applied to 1 x 3 m plots of turf maintained as appropriate on the sandy loam soil research ranges at the Guelph Turfgrass Institute (weekly mowing at 40 mm, regular fertility, irrigation to prevent stress). Treatments were replicated four times in a randomized complete block design. Treatments were applied in 5 applications (monthly June 8 – September 25). Treatments were applied with a compressed air sprayer (20 psi; 50 ml m<sup>-2</sup> 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 weekly for the 40 mm height of cut.

Color response and general vigor of the turf was assessed, both visually and using canopy reflectance (chlorophyll meter, Greenseeker NDVI and R/NIR), daily for the first week after application and then weekly for 3 weeks until next application date or the end of the trial (Nov. 1). Uniformity of the color response was assessed visually. Plots were rated for turf quality, density and uniformity. Clippings were collected from a fixed area (1.1 m<sup>2</sup>) of each plot from regular mowings to determine shoot growth rates. Clippings were collected on every mowing date,

Table 1. Treatments

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

All products applied monthly: June 8, July 6, August 4, September 1, and September 25, 2009.





Figure 1. Plot area in Kentucky bluegrass turf on soil range, August 18, 2009.

for a total of 16 collections. An anecdotal photographic record of the experiment was kept.

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

## 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).

*Growth rate.* Shoot growth as estimated by measurements of shoot dry matter accumulation showed a slight reduction in growth in the plots treated with the standard (LI6314), particularly

late in the season after the last application (Table 3.) On many dates there were no significant differences in growth rate among any of the treatments, and on most dates when there was a significant difference, all of the LI6279 treatments were not different from the untreated control, or had larger growth rates than the control.

## DISCUSSION AND CONCLUSIONS

Only the standard LI6314 had a consistent reduction in growth rate compared to the control. Within the LI6279 treated plots there was no consistent rate effect, as higher rates sometimes produced larger growth rate reduction and sometimes smaller reduction than lower rates. None of the treatments had a negative effect on turf color or quality (assessed by canopy reflectance and visually).

Sponsor: United Agri Products Canada Inc.

Table 2. Canopy reflectance of treated plots.

Treatment	May-20	May-29	Jun-08	Jun-09	Jun-11	Jun-12	Jun-15	Jun-16	Jun-18	Jun-22	Jun-25	Jul-02	Jul-08
				1 DAT	3	4	7	8	10	14	17	24	
LI6279-12	0.581 <sup>1</sup>	0.567	0.607	0.605	0.628	0.654	0.656	0.669	0.653	0.673	0.665	0.717	0.662
LI6279-8	0.590	0.547	0.591	0.585	0.611	0.635	0.645	0.656	0.649	0.651	0.666	0.718	0.665
Untreated	0.584	0.569	0.592	0.596	0.621	0.630	0.651	0.658	0.647	0.656	0.667	0.714	0.659
LI6279-4	0.590	0.577	0.591	0.590	0.618	0.628	0.644	0.654	0.640	0.657	0.664	0.717	0.656
LI6314	0.587	0.557	0.593	0.584	0.612	0.625	0.637	0.650	0.642	0.659	0.671	0.718	0.659
LI6279-15	0.582	0.571	0.576	0.573	0.594	0.613	0.630	0.640	0.631	0.640	0.660	0.711	0.654
LI6279-12	-0.003 <sup>2</sup>	-0.002	0.016	0.009	0.007	0.023	0.005	0.011	0.006	0.017	-0.002	0.003	0.004
LI6279-8	0.006	-0.021	-0.001	-0.011	-0.010	0.005	-0.007	-0.002	0.002	-0.004	-0.001	0.004	0.006
Untreated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LI6279-4	0.006	0.009	0.000	-0.006	-0.003	-0.002	-0.007	-0.004	-0.007	0.000	-0.003	0.002	-0.003
LI6314	0.003	-0.012	0.002	-0.012	-0.009	-0.006	-0.014	-0.008	-0.005	0.004	0.004	0.004	0.000
LI6279-15	-0.002	0.002	-0.015	-0.024	-0.027	-0.017	-0.021	-0.018	-0.016	-0.016	-0.007	-0.003	-0.005
Isd p=<0.05	NS	0.015	0.010	0.009	0.010	0.010	0.011	0.007	0.007	0.008	0.006	0.004	0.008
Treatment	Jul-08	Jul-14	Jul-15	Jul-17	Jul-22	Jul-27	Jul-30	Aug-04	Aug-11	Aug-14	Aug-17	Aug-20	
	2 DAT	8	9	11	16	21	24	29	7 DAT	10	13	16	
LI6279-12	0.662	0.651	0.635	0.636	0.625	0.652	0.650	0.663	0.649	0.595	0.661	0.714	
LI6279-8	0.665	0.649	0.629	0.650	0.616	0.649	0.646	0.662	0.648	0.596	0.662	0.717	
Untreated	0.659	0.646	0.629	0.648	0.621	0.646	0.652	0.659	0.643	0.587	0.658	0.715	
LI6279-4	0.656	0.651	0.636	0.638	0.651	0.662	0.656	0.665	0.662	0.586	0.665	0.718	
LI6314	0.659	0.640	0.620	0.636	0.622	0.662	0.657	0.679	0.643	0.573	0.658	0.717	
LI6279-15	0.654	0.642	0.627	0.639	0.619	0.653	0.637	0.653	0.627	0.586	0.653	0.705	
LI6279-12	0.004	0.005	0.006	-0.012	0.004	0.006	-0.002	0.004	0.006	0.008	0.002	-0.001	
LI6279-8	0.006	0.003	0.000	0.002	-0.004	0.003	-0.007	0.003	0.004	0.009	0.004	0.003	
Untreated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LI6279-4	-0.003	0.005	0.007	-0.010	0.013	0.016	0.003	0.006	-0.002	0.000	0.007	0.003	
LI6314	0.000	-0.006	-0.009	-0.012	0.001	0.016	0.005	0.020	-0.001	-0.014	-0.001	0.002	
LI6279-15	-0.005	-0.004	-0.002	-0.009	-0.002	0.007	-0.015	-0.006	-0.017	-0.001	-0.006	-0.010	
Isd p=<0.05	0.008	0.007	0.006	0.009	0.009	0.009	0.009	0.006	0.010	0.013	0.005	0.006	
Treatment	Aug-24	Aug-28	Aug-31	Sep-02	Sep-08	Sep-10	Sep-11	Sep-14	Sep-17	Sep-22	Oct-06	Oct-14	Oct-21
	20	24	27	1 DAT	7	9	10	13	16	21	11 DAT	19	26
LI6279-12	0.700	0.684	0.686	0.664	0.706	0.703	0.687	0.705	0.720	0.699	0.667	0.670	0.652
LI6279-8	0.699	0.682	0.684	0.660	0.709	0.706	0.696	0.715	0.726	0.705	0.675	0.681	0.656
Untreated	0.701	0.683	0.683	0.656	0.710	0.710	0.698	0.712	0.723	0.697	0.668	0.677	0.656
LI6279-4	0.699	0.682	0.681	0.655	0.707	0.703	0.687	0.706	0.717	0.697	0.676	0.678	0.654
LI6314	0.702	0.691	0.692	0.664	0.706	0.699	0.680	0.698	0.715	0.701	0.669	0.674	0.651
LI6279-15	0.697	0.674	0.682	0.660	0.705	0.703	0.686	0.699	0.715	0.695	0.672	0.668	0.651
LI6279-12	-0.001	0.001	0.003	0.007	-0.004	-0.007	-0.011	-0.006	-0.003	0.002	0.001	-0.007	-0.004
LI6279-8	-0.002	-0.001	0.001	0.004	-0.001	-0.004	-0.002	0.003	0.003	0.008	0.009	0.004	0.000
Untreated	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LI6279-4	-0.002	-0.001	-0.002	-0.001	-0.003	-0.007	-0.011	-0.006	-0.006	0.000	0.008	0.001	-0.002
LI6314	0.001	0.008	0.009	0.008	-0.004	-0.011	-0.018	-0.013	-0.008	0.004	0.005	-0.003	-0.006
LI6279-15	-0.004	-0.009	-0.001	0.004	-0.005	-0.006	-0.012	-0.013	-0.008	-0.001	0.002	-0.009	-0.005
Isd p=<0.05	0.004	0.005	0.004	0.003	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005

<sup>1</sup> Normalized-difference vegetation index; means of 40-50 readings x 4 replicates.

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



Table 3. Shoot growth rate; dry mass of clippings collected from Kentucky bluegrass turf mowed at 37 mm every 7 days.

Treatment	Jun-16 8 DAT	Jun-23 15	Jun-29 21	Jul-06 28	Jul-13 7 DAT	Jul-20 14	Jul-27 21	Aug-04 29
Untreated	0.78 <sup>1</sup>	1.15	1.45	1.99	1.49	1.48	<b>0.80 ab</b>	1.50
LI6279 3.85	0.51	0.83	1.05	1.60	1.25	1.17	<b>0.71 ab</b>	1.09
LI6279 7.7	0.69	0.97	1.22	1.79	1.65	1.53	<b>1.01 a</b>	1.85
LI6279 11.5	0.60	0.96	1.06	1.55	1.42	1.23	<b>0.89 ab</b>	1.60
LI6279 15.4	0.68	1.06	1.27	1.84	1.39	1.49	<b>1.12 a</b>	1.85
LI6314 7.7	0.63	0.84	1.09	1.74	1.24	1.08	<b>0.43 b</b>	1.12
Untreated	0.00	0.00	0.00	0.00	0.00	0.00	<b>0.00 ab</b>	0.00
LI6279 3.85	-0.27 <sup>2</sup>	-0.32	-0.40	-0.39	-0.25	-0.31	<b>-0.09 ab</b>	-0.41
LI6279 7.7	-0.09	-0.18	-0.22	-0.21	0.16	0.05	<b>0.21 a</b>	0.35
LI6279 11.5	-0.18	-0.19	-0.38	-0.44	-0.07	-0.25	<b>0.09 ab</b>	0.10
LI6279 15.4	-0.10	-0.09	-0.17	-0.16	-0.10	0.01	<b>0.32 a</b>	0.35
LI6314 7.7	-0.15	-0.32	-0.35	-0.25	-0.26	-0.40	<b>-0.37 b</b>	-0.38
lsd p=0.05	NS	NS	NS	NS	NS	NS	<b>0.52</b>	NS
Untreated	1.55	2.25 abc	2.54 ab	1.62	2.62 ab	1.41 ab	1.14 a	0.75 b
LI6279 3.85	1.10	1.77 bc	2.05 bc	1.33	2.07 bc	1.24 ab	1.09 a	0.69 b
LI6279 7.7	1.71	3.22 a	3.05 a	1.82	2.77 a	1.65 a	1.37 a	1.06 a
LI6279 11.5	1.50	2.65 ab	2.43 ab	1.61	2.50 abc	1.42 ab	1.24 a	0.83 ab
LI6279 15.4	1.72	2.39 abc	2.51 ab	1.67	2.57 abc	1.61 a	1.23 a	0.92 ab
LI6314 7.7	1.18	1.50 c	1.44 c	1.30	2.02 c	1.00 b	0.49 b	0.32 c
Untreated	0.00	0.00 abc	0.00 ab	0.00	0.00 ab	0.00 ab	0.00 a	0.00 b
LI6279 3.85	-0.44	-0.48 bc	-0.49 bc	-0.29	-0.55 bc	-0.16 ab	-0.05 a	-0.07 b
LI6279 7.7	0.16	0.97 a	0.51 a	0.20	0.15 a	0.24 a	0.22 a	0.31 a
LI6279 11.5	-0.05	0.40 ab	-0.11 ab	-0.01	-0.12 abc	0.01 ab	0.09 a	0.07 ab
LI6279 15.4	0.17	0.14 abc	-0.03 ab	0.05	-0.04 abc	0.21 a	0.08 a	0.17 ab
LI6314 7.7	-0.37	-0.75 c	-1.10 c	-0.33	-0.60 c	-0.41 b	-0.65 b	-0.44 c
lsd p=0.05	NS	1.12	0.81	NS	0.59	0.53	0.46	0.28

<sup>1</sup> Shoot growth rate (g m<sup>-2</sup> day<sup>-1</sup>) from tissue collected; means of 4 replicates.

<sup>2</sup> Shoot growth rate (g m<sup>-2</sup> day<sup>-1</sup>) 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)

