Performance of organic fertilizers and amendments on low- to medium-maintenance Kentucky bluegrass home lawn type turf on poor rootzones – 2008 data

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The objective of this research project was to determine the performance of the sponsor's fertilizer and organic amendment products on low maintenance Kentucky bluegrass home lawn type turf on a poor quality rootzone.

Data collected included the duration and strength of the color response following applications of the tested products, turf quality, uniformity, and density, and resistance of the turf to disease, weed and drought stress.

MATERIALS/METHODS

The six treatments consisted of the sponsor's products (Corn Plus 8-1-6 and Alfalfa 5-1-5 fertilizer, and EasyFlo compost product on aerified and unaerified plots) at the recommended rate and program, as well as an industry standard fertilizer product (25-4-10, 60% SCU) at 150 kg actual N ha^{-1} yr^{-1} and split over 3 applications (Table 1). An unfertilized check treatment was also included. Aerification of compost treated plots was done with hollow tine coring equipment just prior to the first compost treatment application. Treatments were applied to 2 x 2 m plots of mixed species turf maintained as a low maintenance turf on a poor soil (limited topsoil, low fertility) area at the Guelph Turfgrass Institute (Figure 1). Treatments were replicated five times in a randomized complete block design. Treatments were applied May 30, July 17, and September 5, 2008 (alfalfa, corn gluten meal, and NPK standard) or May 30 and July 18, 2008 (compost).

Color response of the turf to treatments was assessed, both visually and using canopy reflectance measurements (Greenseeker normalized-difference vegetation index [NDVI] meter). Uniformity of the color response was assessed from NDVI data. Plots were also rated for turf quality, density and uniformity. Other stresses were be measured as they occurred (disease, weed, drought). Spring greenup will be assessed in April 2009. An anecdotal photographic record of the experiment was kept.

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

RESULTS

Visual ratings: Color, quality, weed infestation. All treatments, except for the unfertilized control, exhibited acceptable color when rated visually once the fertilizer treatments had been applied (Table 2). The corn gluten treatment had the best color and quality ratings among the treatments, and the alfalfa treatment had the lowest. The differences among the fertilized treatments were small. The low quality ratings for all the plots (barely acceptable by the second observation date) were largely a result of the significant broadleaf weed cover in all plots (Table 3).

Canopy reflectance. Patterns in the data observed with the Greenseeker normalized difference vegetation index (NDVI) meter were similar to the visual ratings The fertilized

Table 1. Treatments

Corn Plus 8-1-6	50 kg N ha^{-1} x 3 applications
Alfalfa 5-1-5	50 kg N ha^{-1} x 3 applications
EasyFlo compost – aerified prior to first application	19.5 kg ha^{-1} x 2 applications
+ NPK	+ 50 kg N ha^{-1} x 3 applications
EasyFlo compost – not aerified	19.5 kg ha^{-1} x 2 applications
+ NPK	+ 50 kg N ha^{-1} x 3 applications
NPK control (25-4-10, 60% SCU)	50 kg N ha^{-1} x 3 applications
Untreated check	———

Figure 1. Plot area in low maintenance turf: May 30, 2008 (immediately after aerification and first treatment application).

Table 2. Visual ratings of treated plots.

Treatment	23-Jun		3-Jul	
	color	quality	color	quality
Alfalfa 5-1-5	6.8 b	5.4	7.4 a	6.6 a
Corn Plus 8-1-6	7.8 a	5.4	8.0 a	6.0 ab
EasyFlo compost – aerified + NPK	7.6 ab	5.2	7.8 a	6.4 a
EasyFlo compost – not aerified + NPK	7.6 ab	5.6	7.6 a	6.6 a
NPK control	7.2 ab	5.6	7.2 a	6.2 a
Untreated check	5.6 c	4.6	5.8 b	5.4 b
lsd p=0.05	0.84	NS	0.95	0.63

[1]All visual ratings are on a scale of 0-10, with 10 being best and 6 being acceptable. Means of 5 replicates. Means within columns followed by the same letter are not significantly different (Fisher's protected LSD, p=0.05).

Table 3. Broadleaf weed infestation in treated plots.

Treatment	28-May	23-Jun	3-Jul	8-Aug
Alfalfa 5-1-5	3.4[1]	3.6 ab	4.2	4.2
Corn Plus 8-1-6	4.2	3.6 ab	4.4	4.2
EasyFlo compost – aerified + NPK	4.6	4.4 a	4.4	3.8
EasyFlo compost – not aerified + NPK	4.2	3.6 ab	4.2	3.8
NPK control	4.2	3.0 b	3.6	4.4
Untreated check	4.2	4.4 a	4.6	4.8
lsd p=0.05	NS	0.92	NS	NS

[1]Visual rating on a scale of 0-10, with 10 being approximately 50% weed cover. Means of 5 replicates. Means within columns followed by the same letter are not significantly different (Fisher's protected LSD, p=0.05).

treatments tended to have higher indices, particularly earlier in the season, but the differences were very small (Table 4). All fertilized plots had significantly higher readings than the control, and significant differences developed among the fertilized treatments. Generally, the corn gluten treatment had the highest index value among the fertilized treatments, which is different from the results in 2006. If the seasonal variation in NDVI (as represented by the untreated control plots) is taken out of the data, the change in NDVI as affected by response to the fertilizer treatments can be seen graphically (Figure 2). An initial response to the first application gradually disappeared in late July and August, but then reappeared following the third application. Aerification of the compost treatment appeared to delay the fertilizer response. Corn gluten produced the longest lasting response, while the NPK standard was the shortest.

Table 4. Canopy reflectance readings from treated turf

Treatment	5/26	6/2	6/3	6/5	6/6	6/9	6/11	6/12	6/13	6/16	6/18
Corn Plus 8-1-6	0.872[1] ab	0.876 a	0.900 ab	0.883 c	0.863 c	0.888 b	0.870 bc	0.810 c	0.804 b	0.847 a	0.847 a
EasyFlo compost – not aerified + NPK	0.868 ab	0.871 ab	0.903 a	0.890 ab	0.880 a	0.902 a	0.878 a	0.824 a	0.817 a	0.850 a	0.844 ab
EasyFlo compost – aerified + NPK	0.854 c	0.832 d	0.875 d	0.872 d	0.866 c	0.887 b	0.864 c	0.805 c	0.807 b	0.832 b	0.841 ab
Alfalfa 5-1-5	0.876 a	0.868 b	0.896 b	0.887 bc	0.871 b	0.887 b	0.876 ab	0.814 bc	0.807 b	0.834 b	0.839 b
NPK control	0.866 b	0.873 ab	0.898 ab	0.896 a	0.884 a	0.903 a	0.869 bc	0.823 ab	0.819 a	0.845 a	0.845 ab
Untreated check	0.865 b	0.860 c	0.886 c	0.868 d	0.844 d	0.858 c	0.838 d	0.779 d	0.764 c	0.795 c	0.793 c
lsd p=0.05	0.008	0.008	0.006	0.006	0.005	0.006	0.008	0.009	0.008	0.0088	0.0078

	6/19	6/20	6/23	6/25	6/27	7/2	7/4	7/8	7/9	7/16	7/17
Corn Plus 8-1-6	0.844 ab	0.851 ab	0.866 abc	0.793 a	0.863 a	0.946 a	0.805 a	0.809 a	0.797 a	0.813 a	0.824 a
EasyFlo compost – not aerified + NPK	0.850 a	0.854 a	0.869 a	0.777 b	0.852 a	0.909 c	0.780 c	0.788 c	0.780 b	0.793 bc	0.813 b
EasyFlo compost – aerified + NPK	0.848 ab	0.855 a	0.867 ab	0.789 a	0.851 a	0.918 bc	0.795 a	0.800 a	0.789 ab	0.800 b	0.818 ab
Alfalfa 5-1-5	0.834 c	0.844 b	0.859 c	0.789 a	0.855 a	0.938 a	0.791 c	0.798	0.789 ab	0.798 b	0.813 b
NPK control	0.840 bc	0.846 b	0.860 bc	0.769 bc	0.860 a	0.924 b	0.766 d	0.778 d	0.771 c	0.779 d	0.800 c
Untreated check	0.794 d	0.802 c	0.819 d	0.765 c	0.832 b	0.909 c	0.755 d	0.764 e	0.765 c	0.787 cd	0.803 c
lsd p=0.05	0.009	0.007	0.008	0.011	0.014	0.013	0.012	0.009	0.009	0.0088	0.0085

	7/18	7/21	7/29	8/1	8/5	8/6	8/7	8/8	8/11	8/12	8/13
Corn Plus 8-1-6	0.799 a	0.834 c	0.842 c	0.840 b	0.846 b	0.828 bc	0.821 b	0.827 b	0.831 b	0.830 b	0.836 b
EasyFlo compost – not aerified + NPK	0.792 ab	0.847 a	0.844 b	0.839 c	0.842 c	0.828 b	0.821 b	0.826 bc	0.828 c	0.827 c	0.832 c
EasyFlo compost – aerified + NPK	0.798 a	0.845 a	0.845 ab	0.841 b	0.845 b	0.827 bc	0.819 b	0.824 c	0.829 c	0.828 c	0.833 c
Alfalfa 5-1-5	0.798 a	0.842 ab	0.832 d	0.829 e	0.832 d	0.826 b	0.820 b	0.821 d	0.824 d	0.823 d	0.827 d
NPK control	0.775 c	0.838 bc	0.842 c	0.837 d	0.842 c	0.823 d	0.816 c	0.821 d	0.823 d	0.822 d	0.827 d
Untreated check	0.787 b	0.844 ab	0.846 a	0.844 a	0.849 a	0.835 a	0.829 a	0.832 a	0.837 a	0.835 a	0.840 a
lsd p=0.05	0.009	0.007	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.0019	0.0018

	8/14	8/15	8/18	8/19	8/20	8/22	8/25	8/26	8/29	9/3	9/5
Corn Plus 8-1-6	0.835 b	0.839 b	0.836 b	0.843 b	0.844 b	0.841 b	0.839 bc	0.842 b	0.850 b	0.854 b	0.843 c
EasyFlo compost – not aerified + NPK	0.831 c	0.836 d	0.832 c	0.840 c	0.841 c	0.837 c	0.838 c	0.838 c	0.846 d	0.852 c	0.838 de
EasyFlo compost – aerified + NPK	0.832 c	0.838 c	0.835 b	0.842 b	0.843 b	0.839 bc	0.839 b	0.841 b	0.848 c	0.853 bc	0.846 b
Alfalfa 5-1-5	0.827 d	0.832 e	0.828 d	0.835 d	0.836 d	0.833 d	0.833 d	0.834 d	0.842 e	0.846 d	0.839 d
NPK control	0.827 d	0.831 e	0.827 d	0.834 d	0.837 d	0.832 d	0.830 e	0.832 e	0.842 e	0.846 d	0.837 e
Untreated check	0.840 a	0.843 a	0.841 a	0.847 a	0.848 a	0.846 a	0.844 a	0.846 a	0.854 a	0.858 a	0.850 a
lsd p=0.05	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.0017	0.0018

	9/8	9/11	9/17	9/29	10/3	10/16	seasonal mean
Corn Plus 8-1-6	0.844 c	0.842 c	0.852 c	0.861 b	0.862 b	0.858 a	0.843 a
EasyFlo compost – not aerified + NPK	0.841 d	0.841 c	0.856 b	0.861 bc	0.861 b	0.857 b	0.840 b
EasyFlo compost – aerified + NPK	0.846 b	0.844 b	0.857 a	0.863 a	0.864 a	0.857 b	0.840 b
Alfalfa 5-1-5	0.842 d	0.842 c	0.852 c	0.860 cd	0.860 c	0.856 bc	0.837 c
NPK control	0.839 e	0.841 c	0.855 b	0.859 e	0.859 d	0.856 c	0.836 cd
Untreated check	0.849 a	0.846 a	0.853 c	0.859 de	0.858 d	0.854 d	0.836 d
lsd p=0.05	0.002	0.001	0.001	0.001	0.001	0.001	0.001

[1]Normalized-difference vegetation index. Mean of 15-20 readings x 5 replicates (before July 21) or 30-40 readings x 5 replicates thereafter. Treatments are orded based on overall season mean from highest (Corn Plus) to lowest (control).

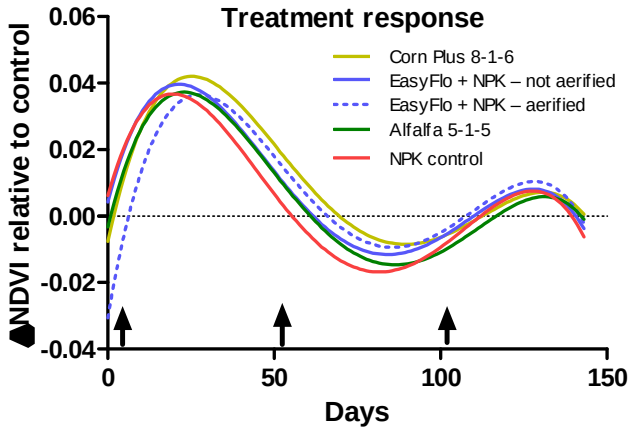

Figure 2. Change in normalized difference vegetation index readings in treated plots, relative to untreated control (=0). Arrows indicate treatment application dates. Curves are fitted 4th order polynomials: goodness of fit (R^2) - Corn Plus 0.87, EasyFlo not aerified 0.83, EasyFlo aerified 0.77, Alfalfa 0.92, NPK control 0.85.

DISCUSSION AND CONCLUSIONS

All fertilized treatments provided significant improvement in nitrogen status over the unfertilized control during the season (20 weeks plus), even though the differences in visual ratings of performance (color, quality) were small. The canopy reflectance data indicated that there was significant turfgrass response to all five fertilizer treatments. Among the experimental treatments, most were as good as or better than the standard NPK treatment on most dates, with the exception of the alfalfa treatment which fell below the standard on a few dates. The best performance came from the Corn Plus treatment. The aerified compost+NPK treatment required a few weeks to recover from the aerification stress.

Sponsor: Turf Revolution and EasyFlo