2006 Natural Organic Fertilizer Trial

Matt Klingenberg, Chris Blume, and Nick Christians
Iowa State University

Introduction:

The purpose of this trial was to evaluate nitrogen (N) release from several experimental, natural organic fertilizers and to compare them to industry standards. This trial was located at the Iowa State University Horticulture turfgrass research station near Gilbert, Iowa.

Materials and Methods:

The trial was conducted as a randomized complete block design with three replications on "Nassau" Kentucky bluegrass turf. The trial had 20 treatments including the untreated control (Table 1). The products were applied in three separate applications. The method of application was a shaker box with the exception of treatment 16, which was a liquid product applied with a CO_2 backpack sprayer.

The Secure and Safe material is corn gluten meal from Grain Processing Corp. of Muscatine, Ia. The Secure and Safe, Nature Safe, Sustane, Renaissance, and Milorganite are natural organic N sources used as industry standards in the study. The Four All Seasons materials are experimentals from Four All Seasons of Holstein, IA. The GPC materials are experimentals from Grain Processing Corp., and the HLF materials are experimentals from Ajinomoto Technology and Engineering Center of Eddyville, IA.

All treatments were applied at 1 lb N/1000 ft^2 three times during the growing season, with the exception of treatments 10 and 12, which were applied twice at 1.5 lbs N/1000 ft^2. This gave a total of 3 lbs N/1000 ft^2 throughout the growing season for each treatment other than the control (Table 1). The application dates for materials applied three times per season were May 5, August 8, and September 8. The application dates for treatments 10 and 12 were May 5 and August 8. Data were collected for 22 weeks after the first treatment (WAT). Quality ratings were taken on a scale of 9 to 1, with 9 being the highest and 6 being acceptable turf quality (Table 4). Grass clippings were collected every week. A 19.5 inch strip was collected down the middle of each plot using a McClain reel mower set at 1.7 inches. This was a total area of 8.125 ft^2 used to collect clippings. After the clippings were taken, they were dried at 67 C for 3 days. The dry clippings were then weighed (Table 2) and recorded in grams of dry tissue. After the clippings had been weighed, two consecutive weeks were combined for determination of tissue nitrogen content. The combined samples were ground through a 20 mesh screen using a Wiley mill grinder. The dried and ground clippings were weighted to one ten-thousandth of a gram and analyzed for total N content by the combustion method at the Iowa State University Agronomy plant and soil analyses laboratory (Table 4).

Results:

All of the materials tested maintained turf quality ratings at acceptable levels throughout the season (Tables 3). They also were effective at producing more clippings than the control at most dates (Tables 2). The NS listed at the bottom of the table for some dates indicates that the means were not significantly different for those dates. This generally occurred early in the study before N was released and then again at the end of the application cycle. Significant increases in N tissue content were found at all testing dates, although products varied in regard to this variable (Table 4). There are dozens of different comparisons that can be made between the experimentals and the industry standards. The data can be obtained in Excel format for easy graphic comparisons from Nick Christians at nchris@iastate.edu.

Treatment		Percent Nitrogen	Lb N/ 1000 ft^2	lb product/ 1000 ft^2	lb product/ 25 ft^2 plot
1	Control	----	-----	-----	-----
2	Urea	46%	1lb	2.2	26.67
3	Secure and Safe	9%	1lb	11.1	126.11
4	Nature Safe	10%	1lb	10.0	113.5
5	Sustane	5%	1lb	20.0	227
6	Sustane	8%	1lb	12.5	141.88
7	Renaissance	8%	1lb	12.5	141.88
8	Milorganite	6%	1lb	16.7	189.17
9	Four All Seasons (1)	9%	1lb	11.1	126.11
10	Four All Seasons (2)	9%	1.5lb	16.7	189.17
11	Four All Seasons (3)	11%	1lb	9.1	103.18
12	Four All Seasons (4)	11%	1.5lb	13.6	154.77
13	GPC 1	15%	1lb	6.7	75.67
14	GPC 2	10%	1lb	10.0	113.5
15	GPC 3	12%	1lb	8.3	94.58
16	HLF (liquid)	6%	1lb	----	-----
17	HLF1	13%	1lb	7.7	87.31
18	HLF2	11%	1lb	9.1	103.31
19	HLF3	11%	1lb	9.1	103.18
20	HLF4	10%	1lb	10.0	113.5

All plots received a total of 3 lbs N/1000 ft^2/season.

Table 2. Dried clipping weights from May 19 to August 8 in grams (g).

Trt.	19 May	26 May	2 June	9 June	16 June	23 June	30 June	14 July	21 July	28 July	3 Aug
1	16.1	8.2	4.6	3.1	2.5	2.0	1.8	3.6	3.8	4.6	4.4
2	17.9	13.2	8.2	6.1	5.0	3.6	3.6	6.0	6.7	6.3	5.8
3	15.5	10.5	7.8	4.8	3.6	2.8	3.2	6.6	7.9	6.5	6.4
4	16.2	9.8	7.8	4.3	4.6	3.5	3.1	5.9	6.8	6.5	6.9
5	17.0	10.8	6.9	4.0	4.1	2.1	2.0	5.3	6.9	5.8	5.7
6	14.1	10.5	8.1	5.4	4.6	3.0	2.7	6.1	8.0	6.0	6.2
7	15.7	10.5	7.6	4.0	5.2	2.5	2.1	5.6	6.6	5.8	5.8
8	14.8	9.6	6.1	4.6	3.5	2.8	2.8	6.3	7.0	6.4	6.6
9	16.7	9.9	7.0	5.1	4.3	3.4	2.6	5.9	6.6	5.5	5.3
10	16.9	12.7	8.1	6.0	5.5	4.5	3.8	6.0	7.1	7.5	6.3
11	15.7	10.4	6.1	4.0	3.4	2.5	2.7	5.8	6.1	5.8	5.3
12	17.2	12.1	9.1	5.0	4.5	3.6	3.2	7.3	8.1	7.5	6.7
13	18.1	12.7	8.4	5.6	5.5	4.6	3.9	6.1	7.7	7.7	6.7
14	15.6	11.1	6.0	4.5	4.3	2.8	2.9	7.0	7.6	6.8	6.2
15	16.0	11.4	7.1	3.7	3.5	2.4	2.9	5.5	6.1	5.9	5.2
16	14.7	9.4	6.3	3.3	2.7	1.9	1.6	4.4	5.0	4.9	4.8
17	14.8	10.8	8.9	4.3	3.9	2.3	2.1	6.5	6.4	6.5	6.5
18	19.8	11.6	8.3	4.4	4.2	3.7	3.0	6.3	7.4	6.8	7.2
19	19.7	14.2	9.3	5.3	5.1	3.3	3.1	5.3	6.5	5.8	5.8
20	19.0	13.3	7.6	5.5	5.0	3.4	3.7	6.1	5.9	5.5	5.6
LSD 0.05	**NS**	**3.1**	**2.2**	**1.7**	**1.5**	**NS**	**NS**	**NS**	**2.2**	**1.7**	**NS**

NS = no significant differences among treatments.

Table 2. (continued) Dried clippings weights from August 11 to October 13 in grams (g)

Trt.	11 Aug	18 Aug	25 Aug	1 Sept	8 Sept	15 Sept	22 Sept	29 Sept	6 Oct	13 Oct	Mean
1	8.2	8.3	6.2	5.4	3.6	4.3	2.3	1.2	0.5	0.7	4.5
2	17.0	17.1	11.9	12.0	6.5	8.7	6.9	4.0	3.0	2.6	8.2
3	11.8	12.7	11.8	9.8	8.7	8.1	5.9	4.4	2.9	4.0	7.4
4	15.5	15.4	11.3	8.9	6.7	8.4	5.4	2.9	2.0	1.9	7.3
5	14.5	14.0	9.7	8.3	6.1	9.4	5.6	3.3	1.9	2.0	6.9
6	15.3	15.6	8.9	10.0	7.0	7.6	4.9	2.9	1.8	2.3	7.2
7	14.3	15.8	9.7	9.5	6.1	8.6	6.4	3.7	2.6	2.3	7.2
8	13.8	16.0	10.0	9.4	6.0	7.8	5.0	2.7	2.0	1.8	6.9
9	11.4	14.9	8.0	10.7	7.0	8.1	5.0	4.1	2.8	3.0	7.0
10	12.8	16.7	12.4	11.6	8.7	10.0	5.7	2.4	1.7	1.7	8.0
11	10.6	13.6	10.3	10.1	7.3	8.6	6.0	3.7	2.6	3.0	6.8
12	13.7	16.6	13.0	11.4	9.7	10.4	5.1	2.9	1.4	2.0	8.1
13	18.1	18.4	11.7	11.5	7.9	9.6	7.5	4.4	3.9	3.1	8.7
14	14.6	14.7	10.8	10.1	7.1	9.3	5.3	3.7	2.6	2.4	7.4
15	13.9	14.3	10.2	9.2	7.1	9.0	6.7	3.8	3.4	3.2	7.2
16	12.1	12.1	9.0	8.1	5.1	8.1	5.5	3.2	1.9	1.9	6.0
17	15.1	24.6	10.0	8.2	6.0	9.6	6.1	3.5	2.0	2.5	7.6
18	17.9	17.9	12.6	10.3	7.2	10.4	7.8	4.6	2.9	3.0	8.4
19	16.0	17.8	11.1	10.3	6.5	11.1	8.6	4.5	3.3	3.0	8.4
20	17.0	17.7	9.7	10.1	5.9	9.9	7.8	4.1	2.7	2.3	8.0
LSD	**3.4**	**NS**	**2.6**	**2.3**	**1.9**	**2.4**	**1.5**	**1.1**	**0.9**	**1.1**	**1.3**

NS = no significant differences among treatments.

Table 3. Quality ratings (9-1); 9=highest quality for dates from May 19 to July 28.

Trt.	19 May	26 May	2 June	9 June	16 June	23 June	30 June	7 July	14 July	21 July	28 July
1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.3	5.3	6.0	6.0
2	7.0	7.3	7.3	7.0	7.3	6.3	7.3	7.3	6.7	7.0	6.7
3	5.7	6.0	6.3	6.7	7.0	6.0	6.3	6.7	6.7	6.3	6.0
4	5.7	6.0	6.0	6.0	6.3	6.0	6.0	6.3	6.0	6.3	6.3
5	6.3	5.7	6.0	5.7	5.7	5.7	5.7	6.0	6.0	6.0	6.0
6	5.7	6.3	6.0	6.0	6.0	5.7	5.7	6.3	6.0	6.3	6.3
7	5.7	6.0	6.3	6.3	6.3	6.0	5.3	6.3	6.3	6.0	6.3
8	6.0	5.7	6.0	5.7	6.0	5.7	6.0	6.0	5.7	6.3	6.0
9	5.3	5.3	6.0	5.7	6.0	5.3	6.0	5.7	5.7	6.3	6.0
10	5.7	6.0	7.0	7.7	7.0	6.7	6.7	6.7	6.7	6.7	6.0
11	5.7	5.3	6.0	6.0	7.0	6.0	6.0	6.0	6.3	6.0	6.0
12	5.7	6.3	7.0	7.0	7.0	6.3	7.0	6.7	6.7	6.3	6.7
13	6.7	6.3	6.0	6.3	6.0	6.0	6.0	6.7	6.0	6.3	6.0
14	6.0	5.7	6.3	6.3	6.7	6.0	6.7	7.0	7.0	7.0	6.0
15	6.7	6.0	7.0	6.3	7.0	6.3	6.7	7.0	6.0	6.3	6.0
16	6.3	6.3	6.3	6.3	6.0	6.0	6.0	6.3	6.3	6.0	6.0
17	6.7	7.0	6.3	6.7	7.0	6.3	6.3	7.0	6.7	6.3	6.3
18	6.7	6.3	6.0	6.0	6.0	6.0	5.7	6.0	6.0	6.0	6.0
19	7.3	7.3	6.3	6.3	6.0	5.3	5.7	5.7	6.0	6.0	6.0
20	7.3	7.0	6.7	6.7	6.3	6.3	6.7	6.3	6.3	6.3	6.3
LSD	**0.9**	**0.7**	**0.6**	**0.9**	**0.6**	**0.7**	**0.9**	**0.9**	**0.7**	**0.7**	**0.6**

Table 3. (continued) Quality ratings (9-1); 9=highest quality for dates from August 3 to October 13.

Trt.	3 Aug	10 Aug	18 Aug	25 Aug	1 Sept	8 Sept	15 Sept	22 Sept	29 Sept	6 Oct	13 Oct
1	6.0	6.3	5.7	5.7	6.3	6.3	6.0	6.0	5.3	5.0	5.0
2	6.3	9.0	8.7	8.7	8.7	8.3	8.7	8.7	9.0	9.0	8.0
3	6.7	7.7	8.3	8.3	8.0	7.7	7.7	7.7	8.7	8.3	8.0
4	6.7	8.3	8.0	8.0	7.7	7.0	7.3	7.7	7.0	7.0	7.0
5	6.0	8.0	7.3	6.7	7.0	7.0	8.0	7.0	7.0	7.0	7.0
6	6.7	8.7	7.7	7.7	7.3	7.3	7.3	7.0	7.7	7.0	7.0
7	6.0	8.7	7.7	7.3	7.7	7.3	8.3	8.3	7.7	8.0	7.0
8	6.3	8.3	7.7	7.0	6.3	7.0	8.0	7.0	7.0	6.7	7.0
9	6.0	7.0	7.3	7.0	6.7	7.7	7.7	7.7	7.7	8.3	7.7
10	6.3	7.7	8.0	8.3	8.0	8.3	8.3	7.0	7.0	6.0	7.0
11	6.0	7.0	7.0	7.3	7.7	7.3	7.3	7.7	8.3	8.0	7.7
12	6.3	8.0	8.7	8.7	8.7	9.0	8.0	7.0	7.0	6.0	7.0
13	6.0	8.7	8.3	7.7	8.0	7.7	9.0	8.7	8.7	8.3	8.0
14	6.3	8.7	7.7	8.7	8.0	8.7	9.0	8.3	8.0	8.3	8.0
15	6.0	8.0	7.7	7.3	7.3	7.3	8.3	8.0	8.3	8.0	7.7
16	6.3	8.3	7.7	7.3	7.0	7.0	8.3	8.7	8.0	7.3	7.3
17	7.0	9.0	8.7	8.3	8.7	8.0	9.0	8.7	8.7	7.7	8.0
18	6.7	9.0	8.3	7.0	7.0	7.0	9.0	8.3	7.7	6.7	7.0
19	6.7	9.0	8.0	8.3	7.3	7.7	9.0	9.0	9.0	7.7	7.3
20	6.3	9.0	8.0	7.7	7.7	7.0	9.0	8.7	7.7	8.0	7.7
LSD	**0.8**	**0.9**	**1.1**	**1.1**	**0.8**	**0.9**	**0.7**	**0.8**	**0.8**	**1.0**	**0.5**

Table 4. Percentage of nitrogen in leaf tissue.

Trt.	19 May	2 June	16 June	30 June	14 July	28 July	11 Aug	25 Aug	8 Sept	22 Sept	6 Oct	Mean
1	2.981	3.068	2.958	2.815	3.151	3.293	3.616	3.694	3.432	3.577	3.420	3.273
2	4.144	3.279	3.427	3.189	3.517	3.512	4.900	4.568	4.550	4.891	4.397	4.034
3	3.390	3.793	3.504	3.223	3.483	3.491	4.417	4.477	4.118	4.708	4.409	3.910
4	3.398	3.485	3.204	3.008	3.430	3.409	4.473	4.114	3.917	4.289	3.936	3.697
5	3.522	3.292	3.096	2.899	3.312	3.367	4.220	3.921	4.069	4.247	3.860	3.619
6	3.466	3.455	3.187	2.954	3.414	3.385	4.341	3.956	3.758	4.221	3.855	3.636
7	3.656	3.574	3.330	3.087	3.439	3.426	4.543	4.134	4.235	4.686	4.026	3.831
8	3.546	3.395	3.162	2.937	3.325	3.337	4.240	4.036	3.831	4.165	3.807	3.617
9	3.424	3.584	3.354	3.034	3.352	3.401	4.422	4.226	4.099	4.614	4.146	3.787
10	3.523	3.724	3.273	3.121	3.449	3.430	4.652	4.599	4.042	4.160	3.802	3.798
11	3.402	3.584	3.237	3.036	3.324	3.344	4.347	4.320	4.139	4.613	4.195	3.777
12	3.614	3.900	3.510	3.250	3.560	3.470	3.743	4.608	3.992	4.044	3.667	3.760
13	3.797	3.623	3.309	3.061	3.304	3.390	4.646	4.279	4.235	4.819	4.159	3.875
14	3.476	3.566	3.442	3.303	3.604	3.547	4.494	4.423	4.402	4.743	4.387	3.944
15	3.800	3.678	3.383	3.033	3.409	3.398	4.571	4.318	4.366	4.826	4.298	3.917
16	3.630	3.472	3.266	2.966	3.361	3.408	4.579	4.205	4.334	4.763	4.084	3.824
17	4.049	3.831	3.455	3.239	3.718	3.687	4.837	4.480	4.491	4.842	4.250	4.080
18	3.778	3.465	3.179	3.006	3.454	3.483	4.752	4.237	4.429	4.691	4.067	3.868
19	3.993	3.531	3.211	3.025	3.405	3.443	4.904	4.274	4.625	4.795	4.081	3.935
20	3.943	3.473	3.147	2.874	3.266	3.350	4.680	4.020	4.164	4.631	4.014	3.778
LSD	**0.203**	**0.371**	**0.221**	**0.193**	**0.216**	**0.160**	**0.604**	**0.194**	**0.252**	**0.254**	**0.176**	**0.135**