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The first section includes lecture notes of papers presented at the 1999 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section includes research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of this section is to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann B. Gould, Editor
Dr. Bruce B. Clarke, Coordinator

RESIDUAL EFFECTS OF COMMERCIAL FERTILIZERS ON THE QUALITY OF KENTUCKY BLUEGRASS TURF

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Nitrogen is the primary nutrient required to maintain high turf quality. Commercial fertilizers provide nitrogen in two forms: quick-release and slow-release. Quick-release nitrogen sources fall into the categories of inorganic salts and urea; they are water-soluble and in a form which is readily taken up by the plant (Murphy, 1994). Slow release nitrogen sources include natural organic sources such as animal tankage, ureaformaldehyde, water-insoluble organic nitrogen compounds, or encapsulated water-soluble sources. Natural organic nitrogen sources have the benefit of building soil organic matter, which improves soil quality. During the growing season, turf color responds to the timing of the nutrient release. Nitrogen that is slowly released causes a slower rate of turf green-up but lasts longer. Slow-release forms of nitrogen help to control the rate of spring growth as well as to produce a more uniform green turf color (Heckman, 1999).

The objective of this study was to evaluate the residual effects of different fertilizers previously applied in a four-year experiment designed to assess the impact of fertilizer on turf quality.

PROCEDURES

This study is a follow up to a turfgrass fertilizer response experiment begun on Kentucky Bluegrass (*Poa pratensis* L.) sod in April 1994 (Heckman et al., 1994 and 1999). A Sassafrass sandy loam soil was used at the Rutgers Horticultural Research Farm II in North Brunswick, New Jersey. Fertilizer applications were made on a regular basis each April, May, September, and October from 1994 to 1998. Fertilizer applications were discontinued after October 1998 so that residual effects of the previous four years of treatment could be observed in the spring and summer season of 1999. Except for the control, this study only examines the treatment where a 4 lb/1000 ft^2 rate of nitrogen (N) was applied and the clippings were removed, although the original experiment also included a 2 lb rate of N and a clipping returned mowing practice. The fertilizer products that were compared in this study are described in Table 1.

Beginning April of 1999, turf quality was rated on a weekly basis prior to mowing. The clippings were removed with a bagging mower. Each plot was mowed weekly to a uniform height of 1.5 inches. Turf quality, determined by evaluating color and grass density, was rated on a 1 to 10 scale, where 10 represented a dark green, dense grass and 1 represented brown, dead grass. Turf quality ratings were averaged monthly (Table 2) and were statistically analyzed using analysis of variance (ANOVA) and the least significant difference (LSD) multiple comparisons test ($\alpha = 0.05$).

RESULTS AND DISCUSSION

In April, Quick Green, a quick-release fertilizer, resulted in the highest average turf color rating (Table 2). Turf Tone fertilizer exhibited similar results to Quick Green, whereas Sta Green, Espoma Organic, and Plant Tone resulted in lower turf quality averages for April. The

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results may be explained by the cool weather of early spring which prevents the microbial activity that is needed for the mineralization of organic nitrogen sources (Murphy, 1994).

In May, the differences produced by the residual nutrients from previously applied fertilizers began to diminish (Table 2, Figures 1, 2). Espoma Organic and Turf Tone, both formulated with a mix of slow and quick-release fertilizer, held the highest average color rating. In June, Espoma Organic had the highest color ratings (Table 2), whereas no differences were exhibited among the other fertilizers. Only the control showed a substantially lower color rating.

In July, the Espoma Organic treatment exhibited the best turf color (Table 2). Plant Tone and Turf Tone were the next best treatments. Quick Green and Sta Green fertilizer treatments exhibited color ratings that were lower than the unfertilized control plots. Sta Green, a slow-release polymer-coated urea, displayed results that were not significantly different from the quick-releasing nutrients in Quick Green fertilizer.

The slow-release nutrients from the fertilizer products containing natural organic materials exhibited the highest turf color ratings near the end of the summer (Table 2). In August, Espoma Organic once again showed the highest color rating, but it was not significantly better than control plots. Quick Green and Sta Green, which do not include any natural organic sources of nitrogen, exhibited lower color ratings than the control plots. They also exhibited a lower color rating than the fertilizers that did contain natural organic nitrogen sources for August, September, and October. In the fall, Espoma Organic followed by Plant Tone, then Turf Tone, all organic sources of nitrogen, continued to produce the highest rankings in turf color rating. The slow-releasing nutrients of Espoma Organic fertilizer provided a good turf color for the longest period following the termination of fertilizer application. This study shows that natural organic nitrogen sources have a more extended period of nutrient release than the polymer coated slow release product, Sta Green.

Changes in soil organic matter content and soil pH may also be responsible for the observed differences in turf quality. We plan to observe the residual effects of the previously applied fertilizer products for another growing season by taking these measurements in 2000.

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Table 1. Commercial fertilizer nutrient sources.

Espoma Organic	Animal tankage, ureaform, triple superphosphate, sulfate of potash (100% slow-release nitrogen)
Plant Tone	Dehydrated manure, animal tankage, crab meal, cocoa meal, bone meal, dried blood, sunflower meal, kelp, greensand, rock phosphate, sulfate of potash (50% slow-release and 50% quick-release nitrogen)
Turf Tone	Dehydrated manure, animal tankage, ureaform, urea, ammonium sulfate, triple superphosphate, sulfate of potash (50% slow-release and 50% quick-release nitrogen)
Quick Green	Ammonium sulfate, triple superphosphate, muriate of potash
Sta Green	Polymer-coated urea, urea, diammonium phosphate, muriate of potash

Table 2. Turf quality responses in 1999 of Kentucky bluegrass turf to residual nitrogen from fertilizer applied from 1994 to 1998.

Fertilizer	Analysis	Nitrogen Applied[1]	Fertilizer Applied[1]	1999 Season Color Ratings[2]						
				April	May	June	July	Aug.	Sept.	Oct.
Control	---	0	0	4.4 c	5.2 b	5.2 c	5.6 b	5.9 abc	5.9 bc	5.5 cd
Espoma Organic	18-8-6	4	22.2	6.3 ab	7.1 a	6.5 a	6.1 a	6.3 a	6.6 a	6.5 a
Plant Tone	5-3-3	4	80	6.1 b	6.8 a	6.0 b	5.5 b	5.8 bc	6.5 ab	6.4 a
Turf Tone	10-6-4	4	40	6.8 a	7.1 a	5.9 b	5.4 b	5.7 bc	6.4 ab	6.3 ab
Quick Green	10-6-4	4	40	6.9 a	6.9 a	5.9 b	5.0 c	4.5 f	5.3 d	5.2 de
Sta Green	29-3-4	4	13.8	6.6 ab	6.8 a	5.9 b	5.0 c	5.0 e	5.6 dc	5.0 e

[1]Nitrogen or fertilizer applied at the rate of lb/1000 ft^2/year. Clippings were removed.

[2]Turf quality rated on a 1 to 10 scale where 10 represents a dark, dense grass and 1 represents brown, dead grass. Means within a column followed by the same letter are not significantly different at $P = 0.05$ by LSD test.

Figure 1. Kentucky bluegrass color responses by week in 1999 to residual fertilizers applied from 1994 to 1998 at the Rutgers Horticultural Research Farm II, North Brunswick, NJ.

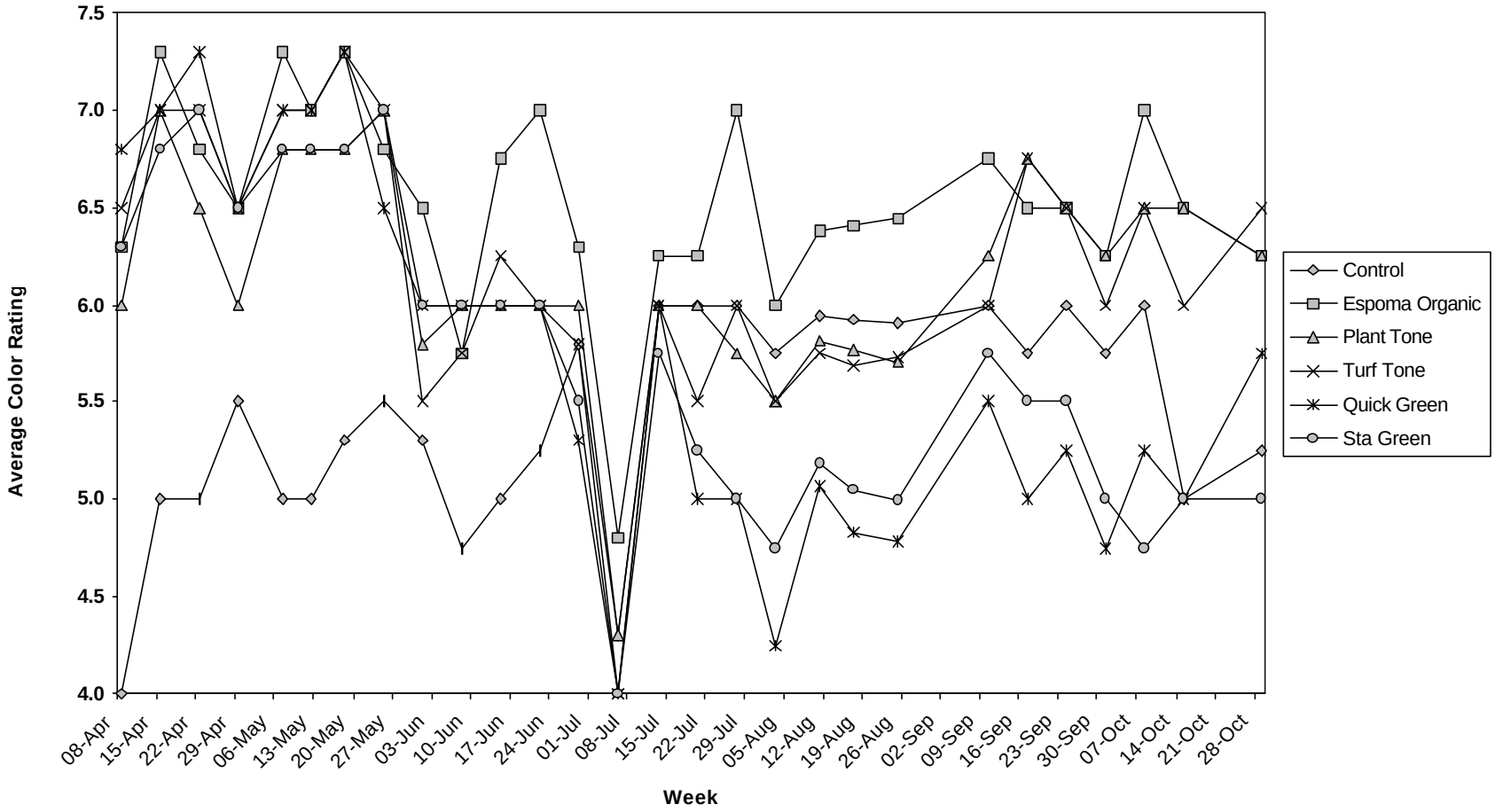

Figure 2. Kentucky bluegrass color responses by month in 1999 to residual fertilizers applied from 1994 to 1998 at the Rutgers Horticultural Research Farm II, North Brunswick, NJ.