

2014 Agrium AT Fertilizer Trial
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Objectives

The objective of this research was to quantify turf response to slow- and controlled-release urea-based fertilizers designed for season-long performance.

Materials and Methods

Plots (5' x 5') were established on Kentucky bluegrass (*Poa pratensis*) at the John Seaton Anderson Turfgrass Research Facility in Mead, NE. The turf was mowed once weekly at a height of 2.5" with clippings returned, and was irrigated four times weekly to replace 80% of water lost through evapotranspiration (ET). No fertilizers had been applied to the plot space in 2014 prior to initiation of the study. Experimental treatments were arranged in a randomized complete block design with four replications. Individual plots were separated by alleys (3') to prevent clippings carry-over from plot-to-plot during mowing. Experimental fertilizer treatments (Table 1) were applied once on May 8, 2014, and the urea control was applied on six week intervals thereafter. Treatments were applied to individual plots by hand through shaker jars, and at least three passes were made over each plot to ensure uniform application.

Visual color was rated every 14 days on a 1-9 scale, where 1 represented no green color, 9 represented dark green turf, and 6 was deemed minimally acceptable color. Visual quality was rated every 14 days on a similar 1-9 scale, where 1 represented dead turf, 9 represented perfect turf, and 6 was deemed minimally acceptable lawn quality. Chlorophyll index (CI) was measured every 14 days with a Spectrum Technologies CM1000 on a 0-999 scale where higher values represent greener turf. Clipping yield was measured every 14 days; clippings were collected from a single 22" x 5' pass, and the location of this pass was varied each time so as not to remove a significant amount of N from plots. Soil temperature was monitored daily at a 2" depth from a weather station located at the research facility.

Visual color, quality, CI, and clipping yield were subjected to analysis of variance (ANOVA) to determine the effect of treatment on turfgrass performance. Means were separated with Fisher's protected LSD.

Results

Visual Color, Quality, and CI

Urea applied on a six week interval resulted in the highest color, quality, and CI ratings when averaged across all rating dates (Table 1). This was expected as the protocol specified 43% more N be applied to that treatment compared to the controlled release products. All of the other treatments performed better than the non-fertilized control, with similar color, quality, and CI

responses for Duration SIFI, Florikote 42, Surfcote 6, and Polyon blend. Nitroform produced lower color, quality, and CI compared to other fertilizers. Surfcote 6 was the best performing fertilizer after the initial application on 8 May, but the response began to decline in early July while other slow-release products continued to release through this time period (Figs. 1 and 2). By the end of the growing season, Surfcote 6-treated plots had lower color and quality ratings than other fertilizers. Polyon blend and Nitroform appeared to release more slowly than other products from May through Aug., but produced responses in the fall that were similar to Duration SIFI and Florikote 42. Overall, Duration SIFI and Surfcote 6 appeared to be the best performers. Surfcote 6 the greatest response early in the season. Duration SIFI had a lesser response early in the season, but continued to provide N into the fall, resulting in acceptable color and quality rating throughout the majority of the study. On the last rating date, plots treated with Duration SIFI had CI ratings equal to the urea-treated plots.

There was a marked decrease in color, quality, and CI in late August, and there was not a strong visual response from the 31 July urea application. Heavy rain events in late August may have resulted in N leaching, causing all treatments to decline. The fall application of urea allowed plots to recover, but the plots receiving slow-release N did not recover color and quality to the same degree. Soil mineralization was likely high in July and early August, causing the color, quality, and CI of the non-fertilized control to increase throughout this time period (Figs 1-3). This suggests that fertilizers applications in mid-summer are less efficient as soil mineralization supplied the turf requirement for nitrogen.

N response (clipping yield)

Clipping yield was greatest for plots treated with urea and Surfcote 6, when averaged across all rating dates (Table 1). Duration SIFI, Florikote 42, and Polyon blend produced similar clipping yields, and the Nitroform had the lowest mean clipping yield of all fertilizer treatments. All fertilizers produced greater clipping yields than the non-fertilized control. Early in the study, Surfcote 6 produced greater clipping yields than most other treatments, but clipping yield was the same for all of the slow release fertilizers by the end of the study. Similar to the color, quality, and CI ratings, the clipping yield data show the same increase in July and sharp decline in late August, providing further evidence that fertilizer applications made during periods of high soil mineralization are inefficient.

Conclusions

Urea applied on a 6-week interval produced acceptable color and quality throughout the majority of the study, with the exception of a late-August decline that affected all plots. Surfcote 6 produced a rapid response early in the study, but performed poorly later in the season. Duration SIFI was more consistent overall, with a slower release early in the study and acceptable performance in the fall. Florikote 42 also had a slower release early in the study, but did not perform as well as Duration SIFI later in the season. Nitroform and Polyon blend had the slowest release after application, but both products performed similarly well in the fall.

Tables and Figures

Table 1. Treatment descriptions, rates, and application intervals for 2014 field study.

Treatment	Analysis	Rate	Total Apps	Application Interval	Total Rate
		lbs N 1000 ft ⁻²			lbs N 1000 ft ⁻²
Urea	46-0-0	1	4	6 weeks	4
Duration SIFI	43-0-0	2.8	1	once	2.8
Florikote 42	42-0-0	2.8	1	once	2.8
Surfcote 6	42-0-0	2.8	1	once	2.8
Nitroform	39-0-0	2.8	1	once	2.8
Polygon blend	42-0-0	2.8	1	once	2.8
Non-fertilized control	-	-	-	-	-

Table 2. Responses of visual color, quality, chlorophyll index, and clipping yield when pooled across all rating dates.

Fertilizer Treatment	Visual Color	Visual Quality	Chlorophyll Index	Clipping Yield
	1-9 scale	1-9 scale	0-999 scale	dry g m ⁻²
Urea	6.9 a	6.9 a	571 a	40.0 a
Duration SIFI	6.4 b	6.4 b	539 b	34.8 b
Florikote 42	6.3 bc	6.3 bc	505 c	34.6 b
Surfcote 6	6.3 bc	6.4 bc	521 bc	39.9 a
Nitroform	6.0 d	6.0 d	472 d	30.0 c
Polygon blend	6.2 cd	6.2 c	506 c	34.8 b
Non-fertilized control	5.4 e	5.6 e	437 e	25.0 d

Abbreviated ANOVA Table

Source of variation				
Treatment	***	***	***	***
Date	***	***	***	***
Date*Treatment	***	***	***	***

*** p value less than 0.001

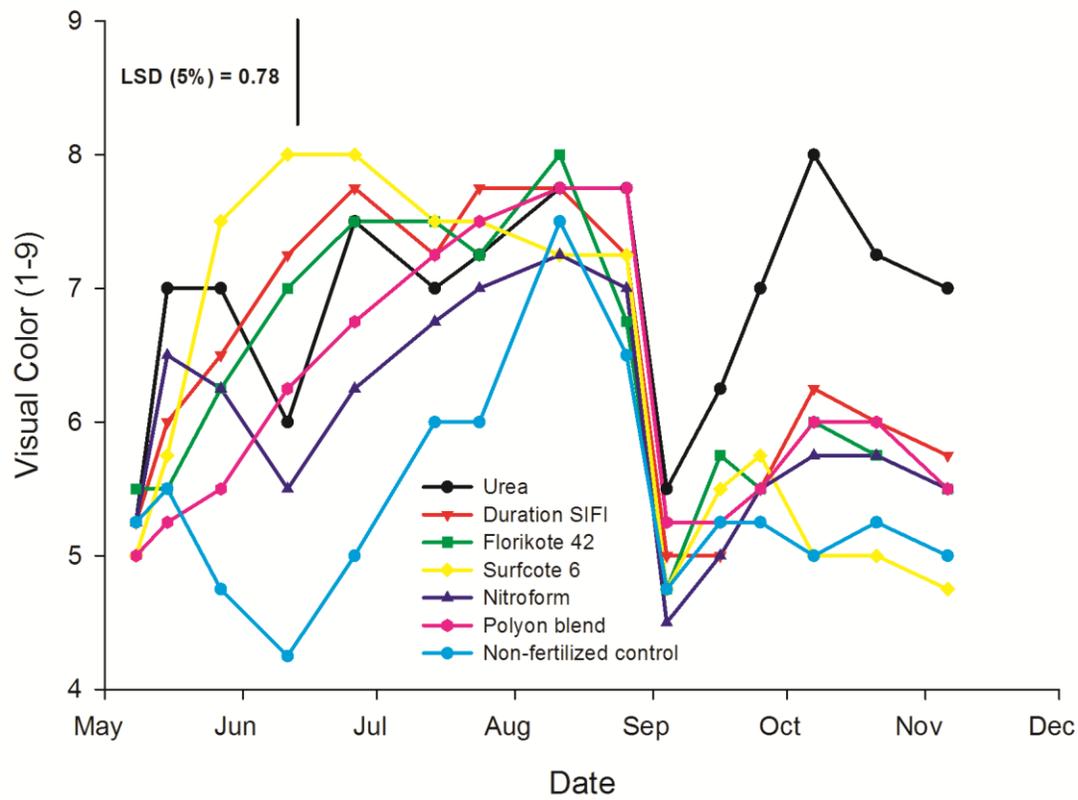


Figure 1. Visual color as affected by fertilizer treatment and date. All fertilizers were applied on 8 May, and urea was reapplied on 19 June, 31 July, and 11 Sept.

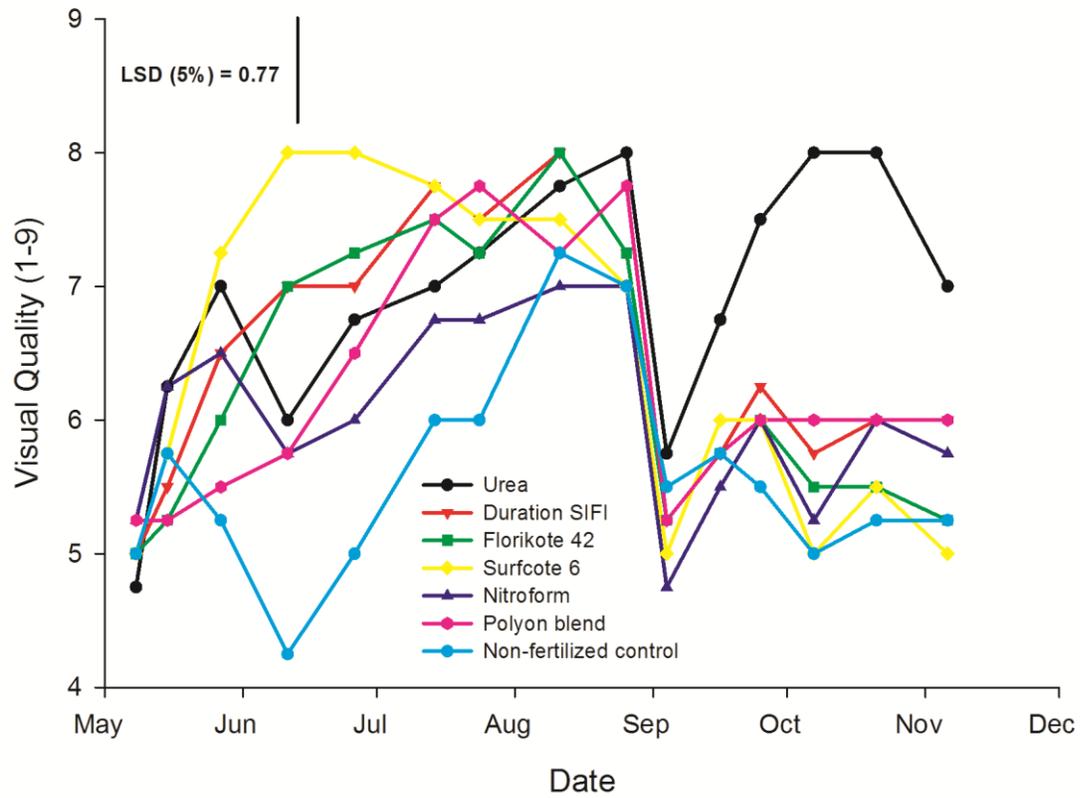


Figure 2. Visual quality as affected by treatment and date. All fertilizers were applied on 8 May, and urea was reapplied on 19 June, 31 July, and 11 Sept.

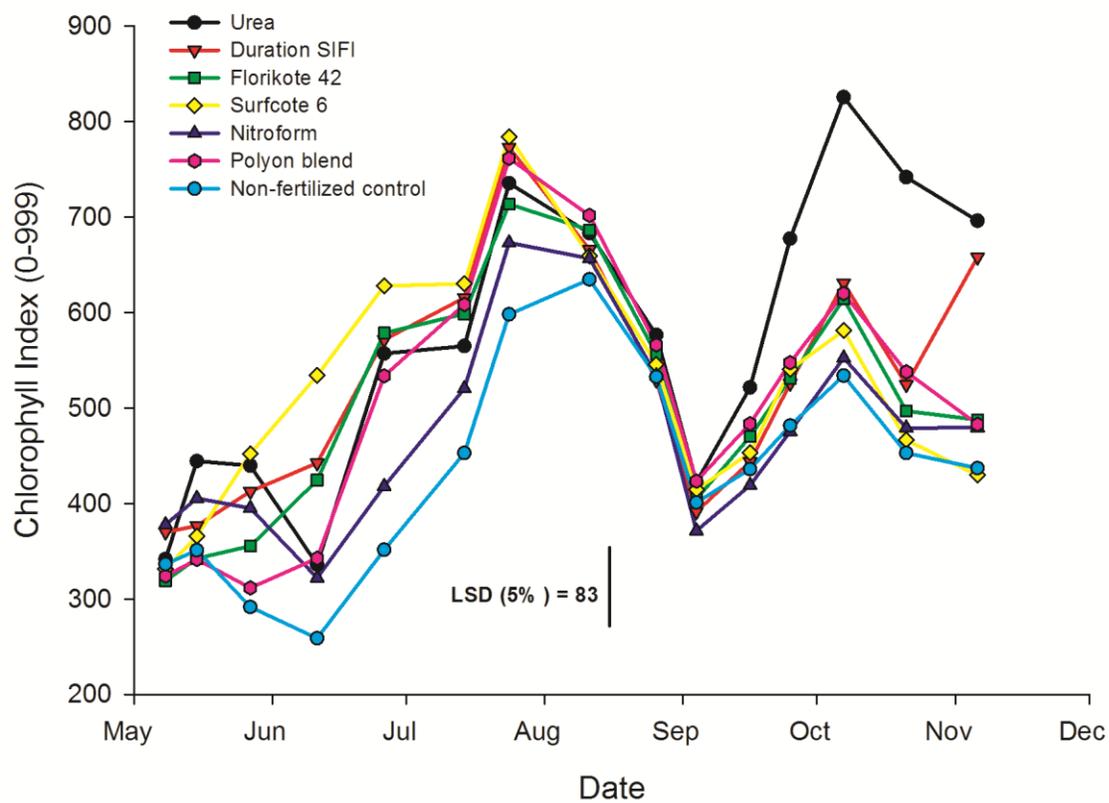


Figure 3. Chlorophyll index as affected by fertilizer treatment and date. All fertilizers were applied on 8 May, and urea was reapplied on 19 June, 31 July, and 11 Sept.

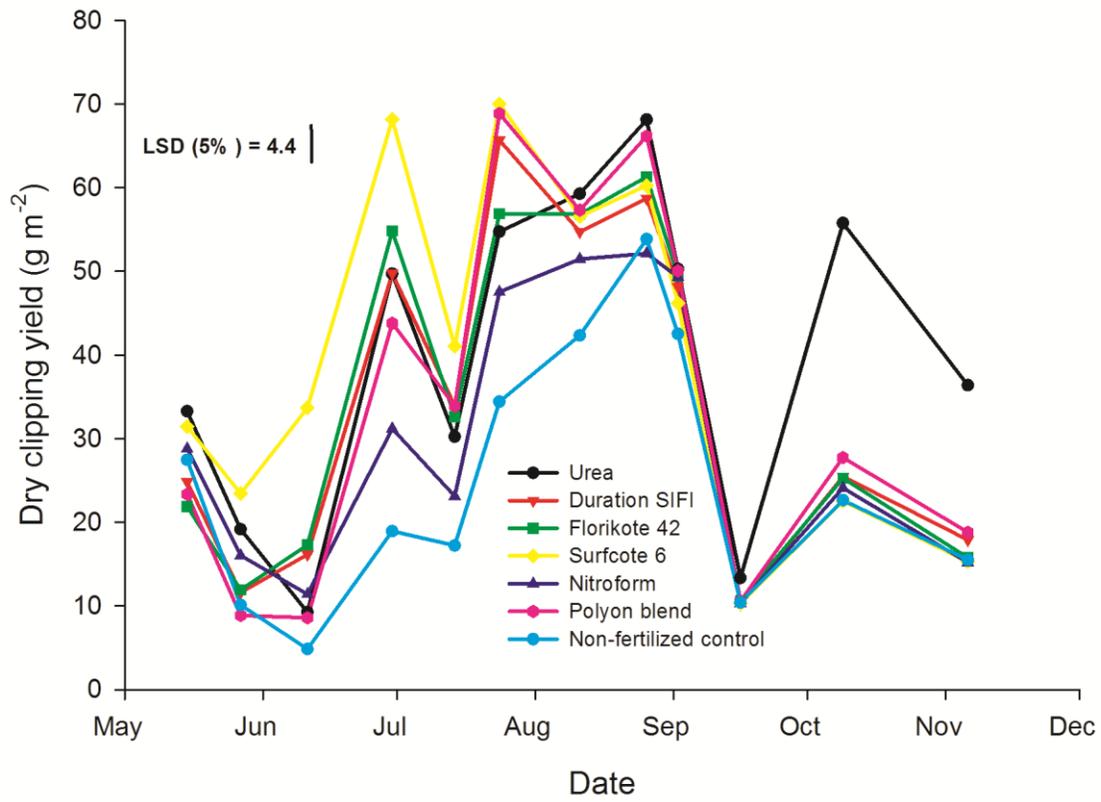


Figure 4. Clipping yield as affected by fertilizer treatment and date. All fertilizers were applied on 8 May, and urea was reapplied on 19 June, 31 July, and 11 Sept.