

# 2015 Robust Fertilizers – Florida Trial

Plant Science Research and Education Unit  
Citra, FL

University of Florida

Prepared by  
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This study was initiated to determine the effectiveness of Robust fertilizer product to enhance the growth, visual quality, and density of bermudagrass. The study also evaluated the effectiveness of the fertilizer program to reduce the nitrogen fertility required to maintain optimum health of a bermudagrass turfgrass system.

### **Materials and Methods**

The treatments listed below were applied to 5' x 10' plots located at the University of Florida Plant Science Research and Education Unit Located in Citra, FL beginning July 27, 2015. Plots were located on a stand of 'Princess 77' bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) that was established on a native fine sand and maintained under conditions similar to those found on a fairway or athletic field. Each treatment was replicated four times in a randomized complete block experimental design.

#### **Treatments:**

Each of the following treatments were applied at a rate of 2 lb N/1000 sq ft, unless otherwise noted:

1. Untreated Control
2. Polyon 42-0-0
3. Nutralene 40-0-0
4. XCU – 43-0-0
5. Robust 13-3-5
6. Robust 13-3-5 (pound for pound of product against highest analysis) (Robust lb for lb)

For treatments 2, 3, and 4, additional Potassium and Phosphorous was added in order to standardize fertility program against treatment 5.

### **Turfgrass Management Practices**

- Mowing height: 0.5 inches
- Mowing frequency: Two days per week depending on seasonal growth
- Irrigation: Water as needed to provide a high quality surface.
- Pest control: Apply pesticides necessary to provide a high quality surface.
- Cultivation: As needed to maintain high quality playing surface.

Turfgrass visual quality ratings were taken every other week throughout the duration of the study using a 1-9 scale where 1 = worst; 9 = best; 6 = minimally acceptable) (Figure 1). Digital image analysis was performed on digital pictures taken every two weeks of each plot throughout the duration of the study. Images were analyzed using SigmaScan Software through the use of a macro titled "Turf Analysis 1.2" which allows for batch analysis of digital images to calculate percent cover. In addition, the Dark Green Color Index (DGCI) was calculated for each plot based on the data collected through the image analysis process. Biomass was collected monthly during the study to determine growth rate and samples were submitted for Total Kjeldahl Nitrogen (TKN) analysis to determine treatment effect on tissue nitrogen concentration.

Data were analyzed using appropriate statistical methods. All data were analyzed in SAS and means were separated by Duncan's multiple range test (P=0.05).

### **Results and Discussion**

Visual quality was the only variable with a treatment by date of collection interaction. However, date of collection was significant for most variables, and therefore all variables will be presented by date of collection. Any specific observations or insights will be noted in the discussion below.

### **Weather:**

Weather conditions during this study were wetter than average for August and drier than average for September and October (Figure 2). Overall July was wetter than average, but with the study starting at the end of the month the above average rainfall more than likely did not have an effect on the results. In the last few days of July the study area received 1.03" of rain and over the entire study period there was 16.19" of rain. Figures 3 and 4 show the daily high/low temperatures and historical average high/low temperatures for each month of the study.

### **Visual Ratings:**

The Robust treatment was able to maintain visual quality above the minimally acceptable level of 6.0 throughout the study (Table 1). The Robust treatment performed better than the untreated control throughout the entire study. In addition, the Robust treatment outperformed the XCU treatment from day 70 on. The Robust treatment did not produce an increase in visual quality when compared to the Polyon or Nutralene treatments.

The Robust lb for lb treatment resulted in acceptable quality at day 70, however, it was significantly lower than all treatments except XCU and the untreated control after day 56.

While the visual quality ratings for the Robust lb for lb treatment were just below acceptable,

that treatment was able to maintain similar quality levels as the XCU treatment with only having applied 0.6 lb of nitrogen 1000 ft<sup>-2</sup> compared to the 2 lb of nitrogen 1000 ft<sup>-2</sup> that was applied with all other treatments (Table 1).

### **Digital Image Analysis:**

Digital images were collected from the plots once every other week and analyzed to calculate percent green cover (density) and Dark Green Color Index (DGCI). The Robust treatment maintained approximately 80% green cover through the first 86 days (Table 2). The Robust treatment resulted in significantly higher green cover than the XCU treatment at days 70 and 86, but did not result in an increase in green cover when compared with the Polyon or Nutralene treatments. The Robust lb for lb treatment was able to maintain approximately 75% green cover through day 86. At day 70, the Robust lb for lb treatment resulted in lower green cover than the Robust or Nutralene treatments but performed similar than both the Polyon and XCU treatments. At day 86, the Robust lb for lb treatment resulted in significantly lower green cover when compared to the Polyon and Nutralene treatments. By the final collection day, day 98, all fertilizer treatments resulted in green cover that was not significantly different from one another.

There were minimal differences between treatments for the DGCI throughout the study (Table 3). Both the Robust and Robust lb for lb treatments resulted in lower DGCI than the Nutralene treatment, but was not significantly different than any other treatments.

### **Biomass Production and Tissue Nitrogen:**

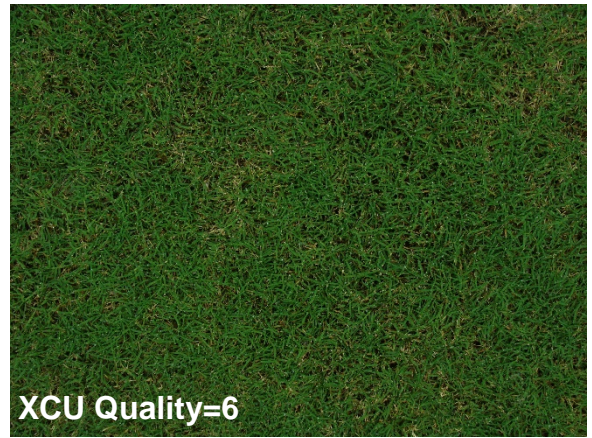
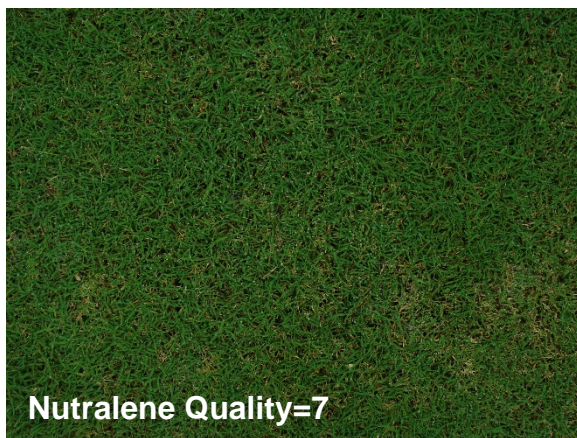
Plots were harvested once every month to determine biomass production and Total Kjeldahl Nitrogen (TKN) concentration in the leaf tissue. The use of robust did not produce an increase in biomass production when compared to the other fertilizer treatments for the August collection (Table 4). For the September collection, the Robust treatment did not result in significantly different biomass production compared to all treatments. For the same collection date the Robust lb for lb treatment resulted in significantly less biomass production when compared to the Polyon treatment while it performed similarly to all other treatments. For the October collection date, both Robust and Robust lb for lb treatments resulted in less biomass production than the Polyon or Nutralene treatments. However, there were no differences between the Robust or Robust lb for lb treatments and the XCU treatments. Overall, the Robust treatment performed similarly to the XCU treatment and below Polyon and Nutralene with regard to biomass production (growth) at the end of the study.

There were no differences in the TKN concentration between treatments for the first two collection dates, August and September. For the October collection date, the Robust treatment resulted in a TKN concentration that was no different than the Nutralene, Polyon, XCU, or UTC treatments. The Robust lb for lb treatment had a similar TKN concentration as the XCU and UTC treatments, but resulted in a significantly less TKN concentration when compared to the Robust, Polyon, and Nutralene treatments. Overall, while the Robust treatment did result in an adequate TKN concentration after three months, it did not increase the concentration over other industry standard products.

## **Summary**

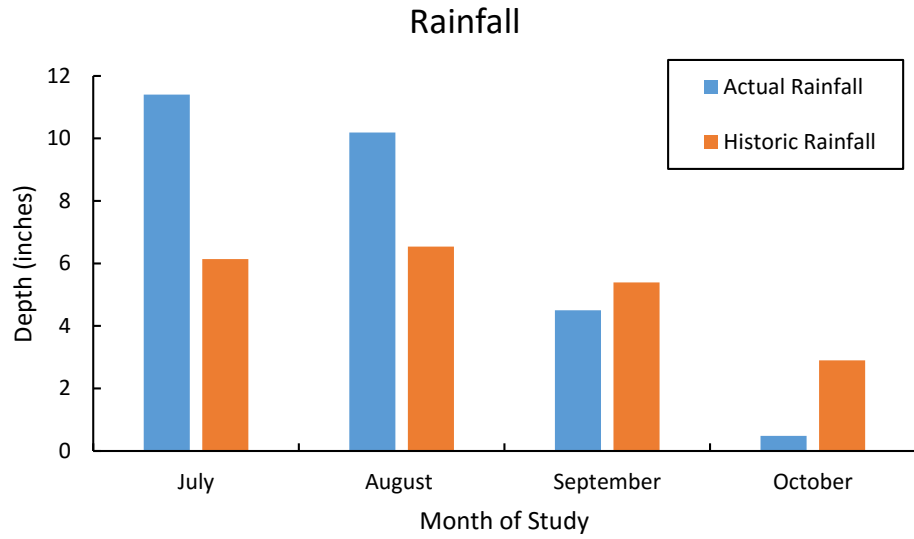
The results of this study showed that the Robust product was able to maintain acceptable visual quality for up to 98 days after the initial application of 2 lb of nitrogen 1000 ft<sup>-2</sup>. The Robust product was also able to maintain approximately 80% green cover for 86 days after initial application. The Robust product performed well during this study with results that were consistently similar to XCU throughout the duration of the trial and frequently as good as both the Polyon and Nutralene treatments.

The Robust lb for lb treatment was able to maintain almost acceptable visual quality throughout the study and resulted in approximately 75% green cover up to 86 days after initial application. Considering the Robust lb for lb treatment was only applied at 0.6 lb of nitrogen 1000 ft<sup>-2</sup> compared to the 2 lb of nitrogen 1000 ft<sup>-2</sup> that was applied with all other treatments, it was able to produce a turf response that exhibited minimal differences between other products in this study. This could partially be due to weather conditions which were nearly ideal and resulted in the turf being under very little stress, particularly in July and August.

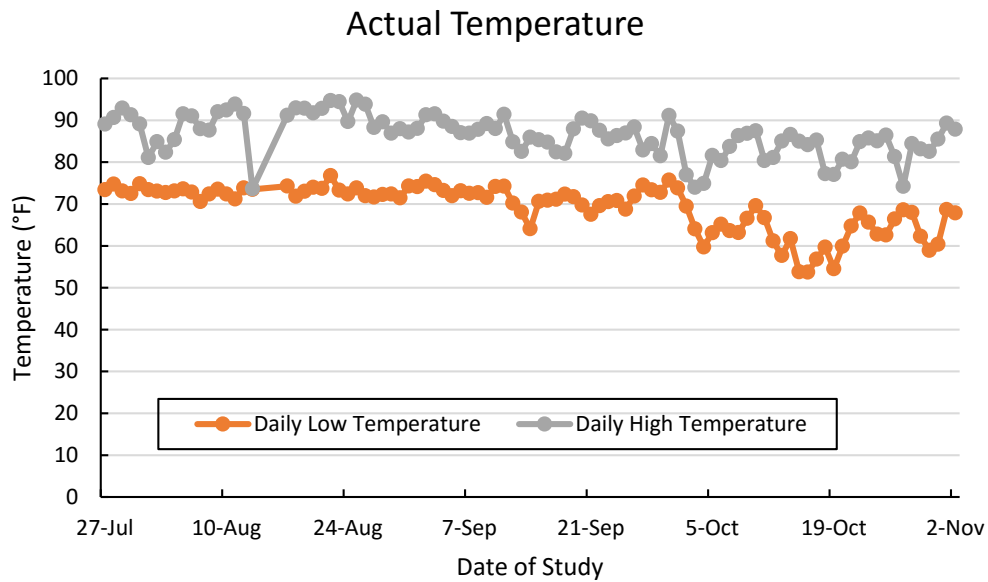


**Figure 1.** Digital images depicting the range of plot quality and the associated visual quality ratings for each treatment at 56d after initial treatment. Plots were rated using the NTEP evaluation scale 9 = high quality, dark green turf, 1 = dead/brown turf, and 5.5 = minimally acceptable turf quality.

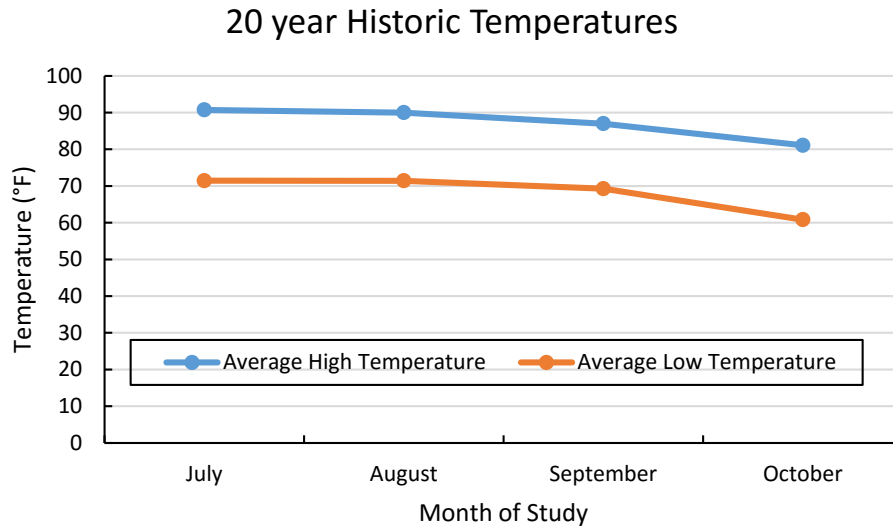




**Figure 2.** Monthly total rainfall and historical mean rainfall for the study period (July-October 2015) for Citra, FL.



**Figure 3.** Daily high/low temperatures for the study period starting July 27, 2015, for Citra, FL.



**Figure 4.** Historical monthly high/low mean temperatures for the study period (July-October 2015).

**Table 1.** Visual quality of plots located in Citra, FL. Plots were rated using the NTEP evaluation scale 9 = high quality, dark green turf, 1 = dead/brown turf, and 6 = minimally acceptable turf quality. Values are presented by collection date.

Treatments	days after initial treatment						
	14	28	44	56	70	86	98
Untreated Control	6.3	5.3b*	5.5b	5.5b	6.0b	5.3b	4.8c
Polyon	6.8	7.3a	7.5a	7.3a	7.5a	6.8a	6.3a
Nutralene	7.0	6.8a	7.5a	7.3a	7.5a	6.8a	6.8a
XCU	7.5	7.5a	7.3a	6.3ab	6.5b	5.5b	5.5b
Robust	7.5	7.3a	7.3a	7.5a	7.5a	6.5a	6.3a
Robust lb for lb	7.3	6.5a	6.5a	5.8b	6.3b	5.5b	5.5b

\*Means within a column, with the same letter are not significantly different at a p value of 0.05.

**Table 2.** Percent green cover as determined through digital image analysis of photos taken from plots throughout the duration of the study. Values are presented by collection date.

Treatments	days after initial treatment						
	14	28	44	56	70	86	98
Untreated Control	85.0	72.7	79.5b*	78.3	83.5c	74.4bc	52.1b
Polygon	86.2	92.4	93.8a	83.8	88.9ab	84.4a	69.3a
Nutralene	90.2	82.2	96.3a	84.6	90.0a	83.9a	71.1a
XCU	88.4	84.1	89.8a	79.2	82.6c	69.8c	60.3ab
Robust	92.0	87.5	94.1a	84.6	89.7a	79.7ab	65.4a
Robust lb for lb	85.8	78.8	86.9ab	79.5	83.9bc	74.6bc	65.2a

\*Means within a column, with the same letter are not significantly different at a p value of 0.05.

**Table 3.** Dark Green Color (DGCI) as determined through digital image analysis of photos taken from plots throughout the duration of the study. Values are presented by collection date.

Treatments	days after initial treatment						
	14	28	44	56	70	86	98
Untreated Control	0.57	0.54b*	0.54	0.54	0.54	0.51b	0.51b
Polygon	0.57	0.56a	0.57	0.56	0.56	0.53ab	0.52b
Nutralene	0.59	0.55ab	0.57	0.56	0.56	0.54a	0.53a
XCU	0.59	0.55ab	0.56	0.55	0.55	0.51b	0.51b
Robust	0.60	0.56a	0.57	0.56	0.56	0.52b	0.51b
Robust lb for lb	0.58	0.54b	0.56	0.55	0.54	0.51b	0.51b

\*Means within a column, with the same letter are not significantly different at a p value of 0.05.

**Table 4.** Biomass production. Values are presented by collection date.

Treatments	Month of Collection		
	August	September	October
Untreated Control	2.8	1.0c*	1.5c
Polygon	5.2	3.5a	6.5a
Nutralene	3.3	2.9ab	6.1a
XCU	3.0	2.2abc	4.1b
Robust	3.8	2.1abc	4.0b
Robust lb for lb	2.9	1.4bc	2.7bc

\*Means within a column, with the same letter are not significantly different at a p value of 0.05.

**Table 5.** Total Kjeldahl Nitrogen (TKN) analysis to determine tissue nitrogen concentration (%). Values are presented by collection date.

Treatments	Month of Collection		
	August	September	October
Untreated Control	3.2	3.5	2.6abc
Polyon	3.5	4.0	3.0a
Nutralene	3.9	4.4	3.1a
XCU	3.3	3.7	2.5bc
Robust	3.6	4.2	2.9ab
Robust lb for lb	33.0	3.8	2.4c

\*Means within a column, with the same letter are not significantly different at a p value of 0.05.