

Evaluation of Fertilizer Products for Turf Quality and

Drought Tolerance on Bermudagrass

Marco Schiavon, Jonathan Montgomery, and Jim Baird

Department of Botany and Plant Sciences, University of California Riverside



Introduction

Water availability, or the lack thereof, outweighs all other biotic and abiotic factors in limiting crop yields. As water resources inevitably decline due to population growth and resultant irrigation requirements, water use must necessarily be reduced, especially during drought. On turf, drought stress will result in discoloration, weed invasion, and reduction of benefits such as reduced erosion, protection of surface water quality, reduction of urban heating and fire hazards. These negative effects can be partially mitigated through the use of warm-season grasses that, due to their specialized photosynthetic process, can tolerate greater degrees of drought stress than other grasses. Sufficient fertilization may help to maintain turf quality under multiple stressors, including reduced water availability.

Research Objective

The objective of this study was to evaluate commercial and experimental fertilizers for their ability to maintain acceptable turf quality under deficit irrigation.

Material and Methods

Location: UC Riverside Turfgrass Research Facility, Riverside

Soil: Hanford fine sandy loam

Grass cultivars: Mature 'Princess 77' bermudagrass turf

Irrigation: The 20-m x 30-m field was divided into six 10-m x 10-m plots. From August 11 until November 10, 2014 plots were hand watered at 40% or 70% of previous week ET_0 , as determined by an on-site CIMIS station. Each ET_0 replacement treatment was replicated three times. Plots did not receive any irrigation during the winter when bermudagrass went into dormancy.

Fertilization: Prior to application of fertilizer treatments, the entire field received a total of 1.46 kg N/100 m² in 2014.

Treatments: Fertilizer products (Table 1) were randomized inside the ET_0 replacement plots and applied monthly beginning August 9, 2014. Each treatment was applied at 49 kg N/ha. All materials were directly applied as granular except the 'Amidas (spray)' treatment.

Granular treatments were applied with shaker jars, while spray treatments were applied using a CO₂-powered hand boom sprayer equipped with TeeJet 8004VS nozzles and output of 8.15 L/100 m².

Ratings collected bi-weekly from August 2014 to March 2015:

- 1) Visual turf quality ratings on a scale from 1 = worst to 9 = best
- 2) Volumetric soil water content (VWC) using time domain reflectometry (TDR)
- 3) Dark Green Color Index (DGCI) as well as percent cover using Digital Image Analysis (DIA)
- 4) Visual turf quality and % green cover using DIA were taken to measure the effect of fertilizer products on bermudagrass green-up in spring 2015
- 5) ANOVA to compare treatments followed by Fisher's protected LSD at 0.05 probability level when appropriate

Results

- 1) Quality: Gro-Power was consistently rated with the highest quality during the study period. Granular Amidas also increased quality, but was only significantly greater than other products (excluding Gro-power) on September 4 and 18, October 16, December 4 and December 31. The lowest quality was observed on plots treated with HGLF and PALB + HGLF (Figure 3).
- 2) Green-up Quality: Summer applications of Gro-Power resulted in the highest quality on all rating dates. Granular Amidas led to a significant increase in quality on March 19 and 27 in comparison to other fertilizers. The lowest quality was found in plots which had received PALB and HGLF (Figure 1).
- 3) Cover: Cover closely mirrored quality results, with Gro-Power consistently resulting in higher turf coverage. Lowest green cover was consistently detected in plots fertilized with HGLF and PALB + HGLF (Figure 2).
- 4) DGCI: Gro-Power, Granular Amidas, and Turf Royale achieved the highest DGCI at the beginning of the study, though by the conclusion no significant differences were detected among treatments. As with quality, HGLF and PALB + HGLF showed the lowest color indices (data not shown).
- 5) Soil Water Content: Plots receiving the previously mentioned effective fertilizers with higher rates of irrigation resulted in the highest soil water content. Turf Royale irrigated at 70% resulted in the highest soil water content (data not shown).



Photo 1. Image of 40% replacement plot showing residual effects of fertilizer treatment on turf greenup. Photo taken after conclusion of the study on 2/21/2015.

Table 1. Properties of fertilizer products used in the fertilizer study in Riverside, CA. 2014.

Treatment	Company	Analysis/Application Rate	Nitrogen Source
Amidas (Granular)	Yara	40-0-0/ 1.22 kg/100 m ²	35% Urea 5% Ammonium
Amidas (Spray)	Yara	40-0-0/ 1.22 kg/100 m ²	35% Urea 5% Ammonium
Turf Royale	Yara	21-7-14/ 2.32 kg/100 m ²	11.1% Ammoniacal 9.9% Nitrate
Calcinit	Yara	15.5-0-0/ 3.15 kg/100 m ²	1.1% Ammoniacal 14.5% Nitrate
PALB + HGLF	AgriPower	1.17 L/ha + 1.17 L/ha	Unknown
HGLF	AgriPower	1.17 L/ha	Unknown
Best Super Turf	Simplot	25-5-5/ 1.95 kg/100 m ²	10.6% Ammoniacal 14.4% Polymer-coated Urea
Gro-Power	Gro-Power	5-3-1/ 9.76 kg/100 m ²	1% Ammoniacal 4% Urea

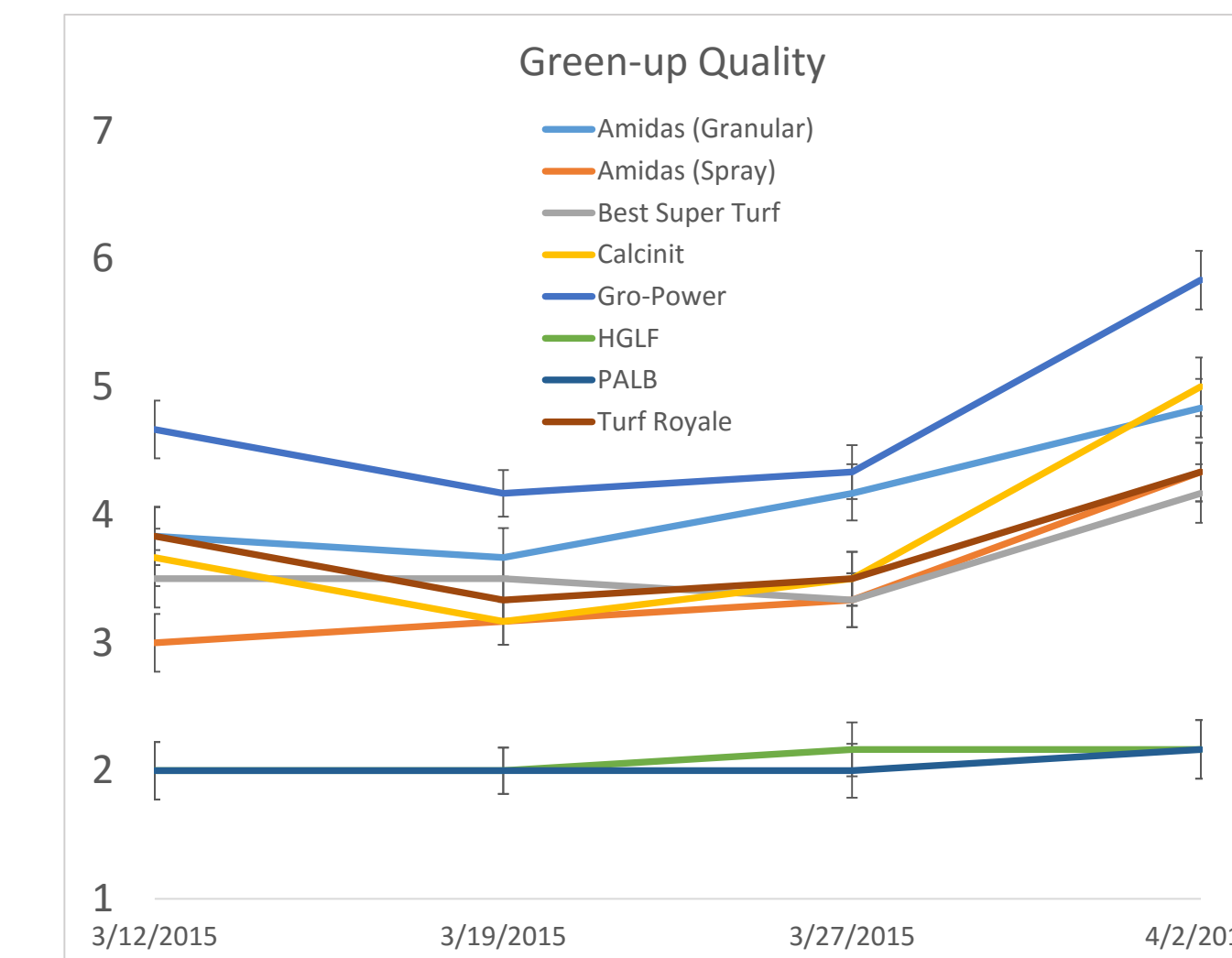


Figure 1. Average turf quality (1 to 9 scale, 9 = best) of plots across irrigation regimes in response to treatments in the fertilizer study during green-up in 2015.

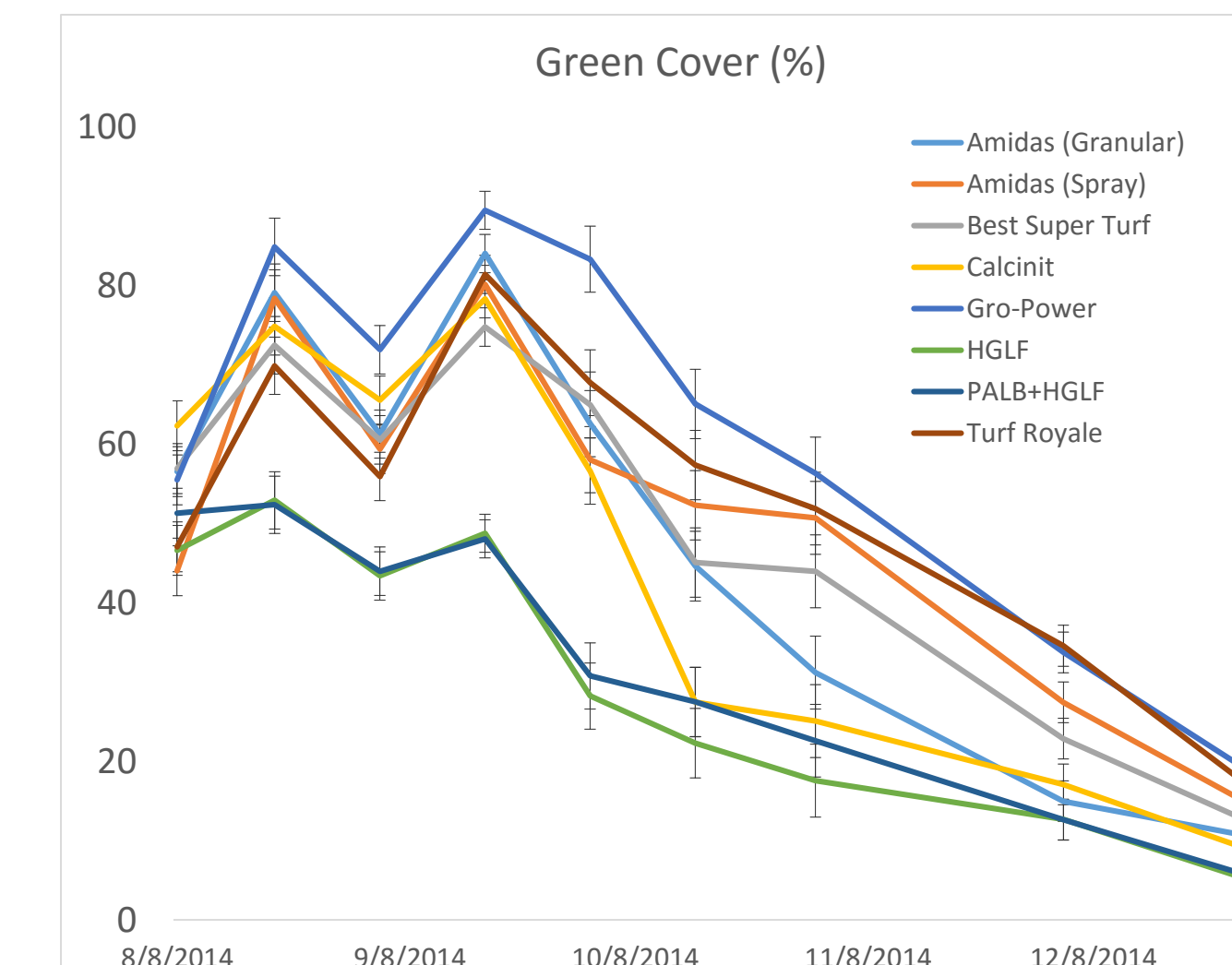


Figure 2. Average percent coverage of plots across irrigation regimes in response to treatments.

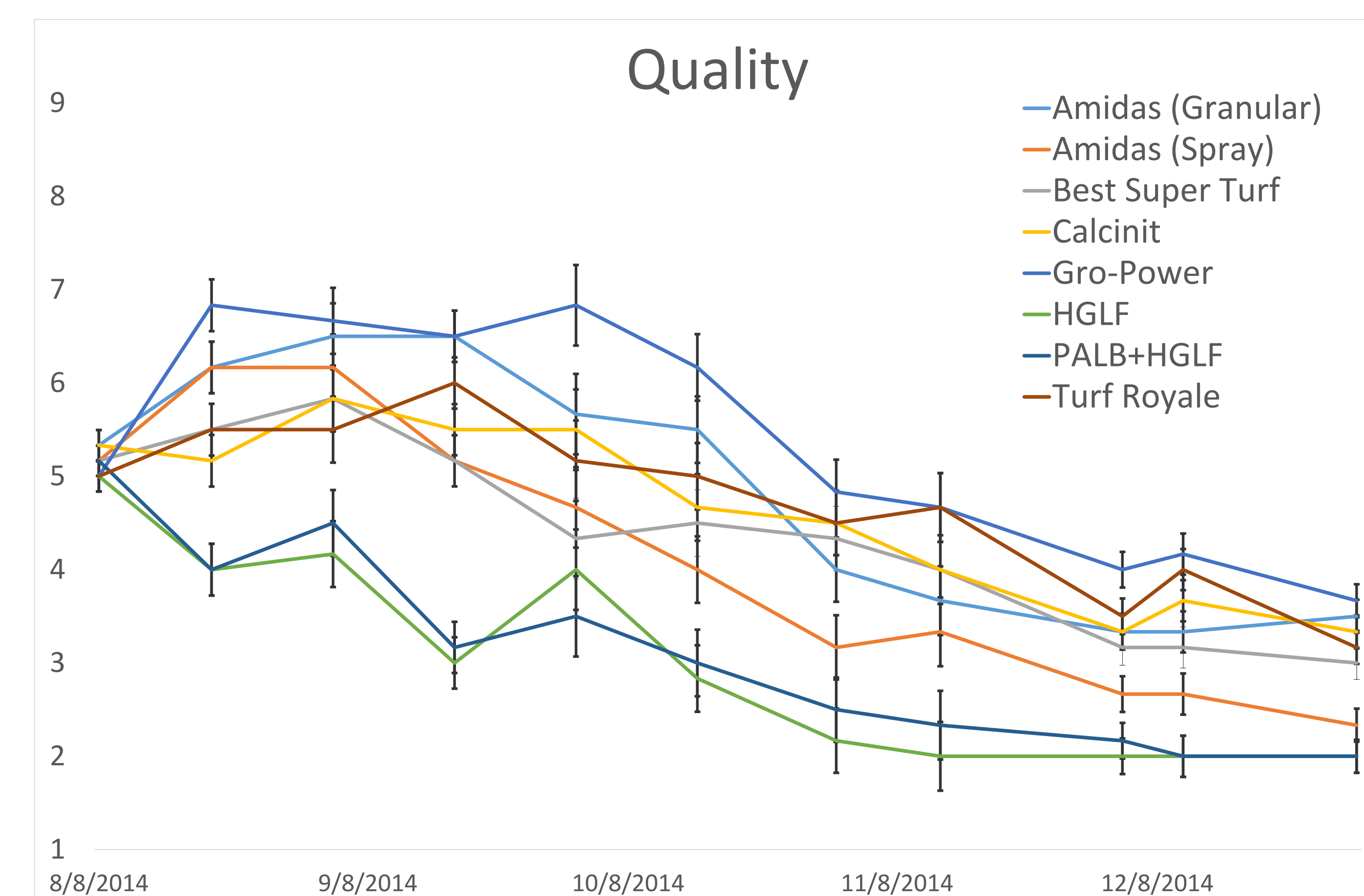


Figure 3. Average turf quality (1 to 9 scale, 9 = best) of plots across irrigation regimes in response to treatments.

Conclusions

- Gro-Power was consistently rated with the highest quality during the study period, and also improved turf quality and green cover during spring green-up.
- Lowest quality during 2014 and spring green-up in 2015 was observed on plots treated with HGLF and PALB + HGLF. Similar results were detected for Dark Green Color Index
- Overall, results of this study substantiated our hypothesis that sufficient N fertilization can help prolong turf quality under drought or deficit irrigation.
- The only product known to have controlled release N (>50%) was Best Super Turf. Limiting irrigation water may have affected release of polymer-coated urea and thus lessened the overall turf quality characteristics provided by this product.

Acknowledgements

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