MINIMIZING NITROGEN INPUTS WHILE OPTIMIZING VERDURE AND GROWTH OF KENTUCKY BLUEGRASS WITH POLYMER COATED UREA

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ABSTRACT

Nitrogen (N) fertilizer increases turfgrass verdure but also increases maintenance costs due primary to mowing. A two-year fertilization study was initiated April 2014 at two established Kentucky bluegrass sites with sand and loamy sand constructed field soils in Provo, UT. A grower's standard practice (GSP) of urea split applied monthly was compared to blend of uncoated and polymer coated urea (PCU). The PCU was applied in 1, 2, or 3 split applications. The dual application applied at 50, 75, or 100% of the recommended full rate. Periodic visual verdure and biomass assessments were made and verdure (as measured by NDVI) and height measurements were taken weekly. The single full rate spring application of PCU resulted in the greatest verdure, but at the expense of greater biomass (mowing requirement). The 75% rate split applied resulted in similar verdure and biomass as the GSP. This ongoing study will continue and include fall applications and a second year of data collection before conclusions are made.

OBJECTIVES

The objectives for this study are to see if 1) a reduction in applied N can be done to minimize shoot growth while maintaining good verdure and 2) the timing of applied PCU is a factor in optimizing growth and verdure through the growing season.

METHODS

Two studies were initiated April 2014 at the BYU turf research plots in Provo, UT, USA on constructed sand and loamy sand fields. We implemented a nitrogen starved system to reduce confounding results due to previous applications.Seven treatments were applied using a randomized block control design (RBCD) with four blocks. The treatments included a Grower's Standard of Practice (GSP) that was a monthly application of urea and ammonium sulfate (AS). The GSP was applied during the growing season of April-November and served as the control. All treatments had AS included as part of the total N because urea is typically applied with AS. The other treatments were a polymer coated urea (PCU; Agrium One Ap, Agrium Advanced Technologies, Loveland, CO, USA) product (Table 1). The "spring" applications occurred in April, "fall" in late August, and the 3 application treatment received an additional application in November.

Each treatment was spread by hand which may have led to some variance in application within individual subplots. In order to compensate for this potential error, measurements were taken across each subplot and an average was recorded. Weekly height and verdure (health of the plant) measurements were taken simultaneously. Height was measured, with a ruler, in cm from the thatch layer to the tip of the grass blade. Verdure was measured using a normalized difference vegetation index (NDVI; FieldScout TCM 500 NDVI Turf Color Meter, Spectrum Technologies, Inc., Aurora, IL, USA). Biomass samples were collected two weeks after the two

full plot applications (Julian days 154 and 260) using a reel mower with a catch basin set at a height of 1 inch. After each subplot was mowed, the blades and catch basin were wiped clean by hand. Each biomass sample was stored in a paper bag and left to air dry for 30 d. Visual ratings were taken right before the two full plot applications and again two weeks after the full applications. Visual ratings were done on a scale of 1-5, one being completely dormant and five being dense dark green turf.

RESULTS

The grower's standard practice (GSP) of split applied urea (#1; Table 1) is assumed to be the "optimum". The full rate of PCU applied with 1, 2, or 3 applications (#2, #4, and #7; Table 1) resulted in significantly more biomass that the GSP for both the sand and loam soils (Fig. 1). The ¾ rate of PCU (#5; Table 1) resulted in the same biomass yield for the loam and significantly less biomass for the sand. The ½ rate of PCU (#6; Table 1) resulted in less biomass for both soils. [Note that the data for the single fall application of PCI (#3; Table 1) is shown but it is important to realize that the application of this N came very late in the season and results from this first year are not realistic as the N applied will likely have the greatest impact in the second year of this trial and, thus, will not be discussed.] Height readings were similar to biomass, although these data show seasonal spikes in growth—especially for the spring application of PCU (#2) and especially for the sand soil (Fig. 2; statistical data not shown).

Nearly all of the treatments had equivalent or better verdure (visual assessment) ratings in both soils when compared to the GSP (Fig. 3). The half rate of PCU had significantly less visual quality than the GSP. The NDVI results verify these visual assessments (Fig. 4). Again, the full rate spring application of PCU gave significantly high NDVI values, especially early in the season. It is interesting to note that the NDVI for the turfgrass grown in loam soil tended to be more similar across N application treatments as compared to the sand.

DISCUSSION

The single spring application of One Ap, which consists of a mixture of uncoated and polymer coated urea, resulted in the best turfgrass aesthetics for both loam and sand soil. However, this N fertilization approach resulted in significantly greater mowing requirements as compared to other treatments. This could be a significant detriment for commercial landscape maintenance companies whose greatest expense is mowing—resulting in increased labor, fuel, equipment, and clipping disposal costs. It would be similarly problematic for homeowners and others who prefer to mow less often. In the case of golf courses and sport turf venues that mow up to daily in an effort to keep the shoots mowed very short, it may not be as significant of a detriment in terms of mowing time—especially in light of the common amongst these venues to have relatively high aesthetics. But it is also noteworthy that high N rates can result in root growth reductions. The root biomass will be assessed after the second year of this study.

Split applications of One Ap did reduce the mowing height problem early in the season, but the effect was moderate. More data is needed over a second year to determine the impact of the late applications that are not fully measured in the data presented here.

Results from the study suggest that a 25% reduction in the rate of PCU opposed to the 100% rate can provide adequate verdure compared to the GSP while reducing the biomass, and in turn mowing rates, and reduce excess N. The 50% reduction in rate of PCU resulted in unsatisfactory verdure, although the mowing reduction was significant and may be desirable where low

maintenance costs are desired and slightly lower verdure is acceptable. But again, a second year of data is needed to verify these results.

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Table 1. Nitrogen fertilizer treatments. (Note that the final application of treatment #7 was not applied prior to collecting the data for this manuscript.)

#	Treatments
1	Urea split (grower's standard practice or GSP) – full rate
2	1 application of OneAp spring – full rate
3	1 application of OneAp fall – full rate
4	2 applications of OneApspring and fall – full rate
5	2 applications of OneApspring and fall – ¾ rate
6	2 applications of OneApspring and fall – ½ rate
7	3 applications of OneApspring, late summer, and late – full rate

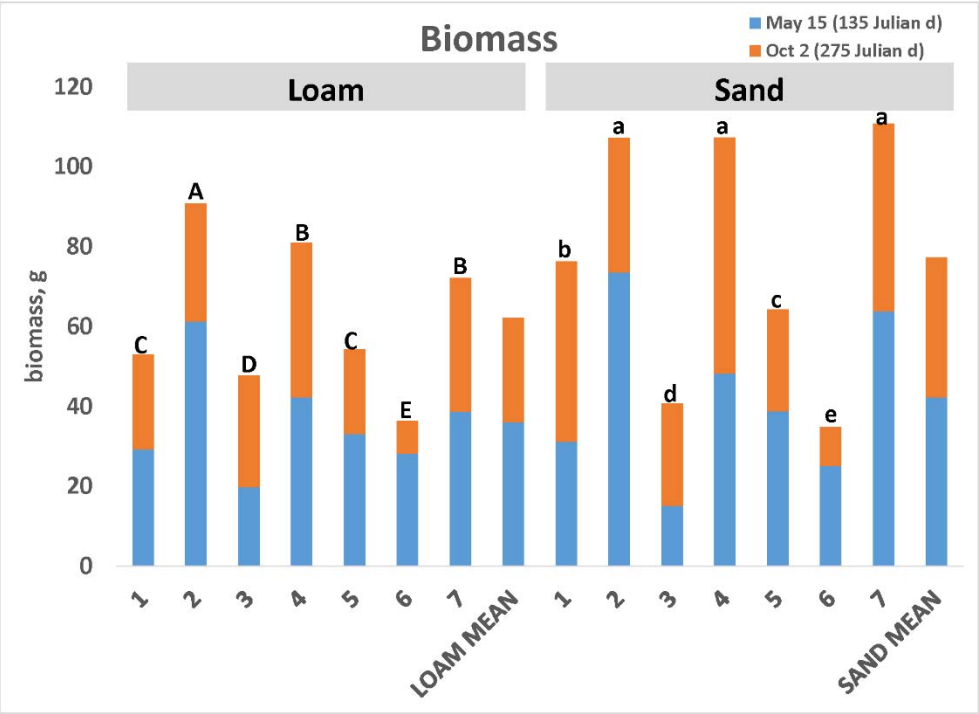

Fig. 1 Biomass for Kentucky bluegrass nitrogen field studies (Table 1 for definition of treatments 1-7). Letters above bars signify statistical significance when comparing those not sharing the same letter(s). The field with loam soil (upper case letters) was analyzed separately than the field with sand soil (lower case letters).

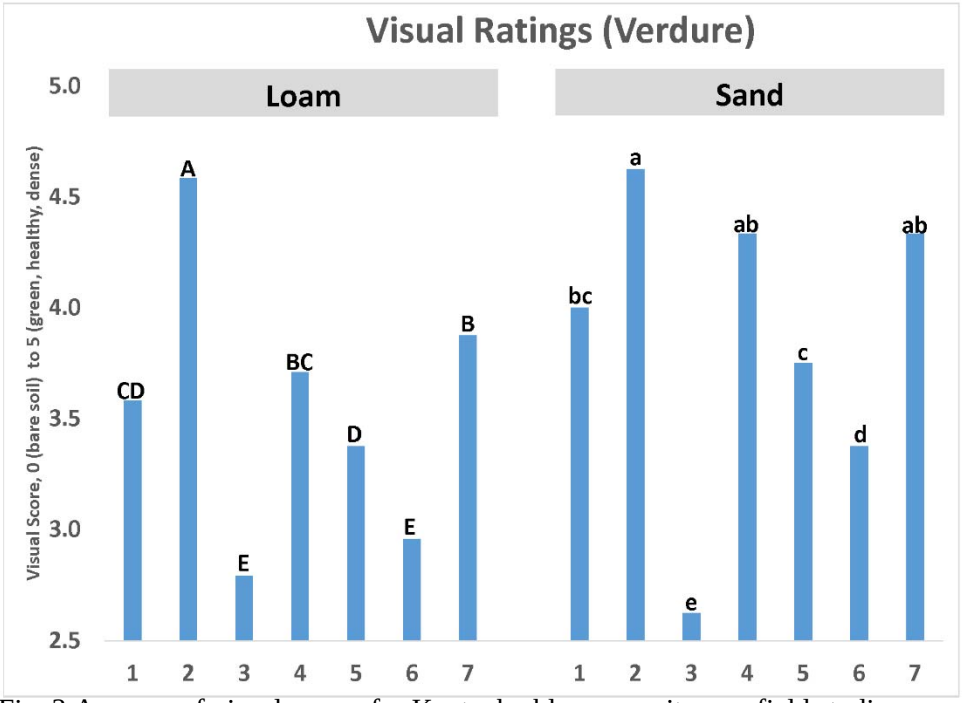

Fig. 3 Average of visual scores for Kentucky bluegrass nitrogen field studies (Table 1 for definition of treatments 1-7). Letters above bars signify statistical significance when comparing those not sharing the same letter(s). The field with loam soil (upper case letters) was analyzed separately than the field with sand soil (lower case letters).

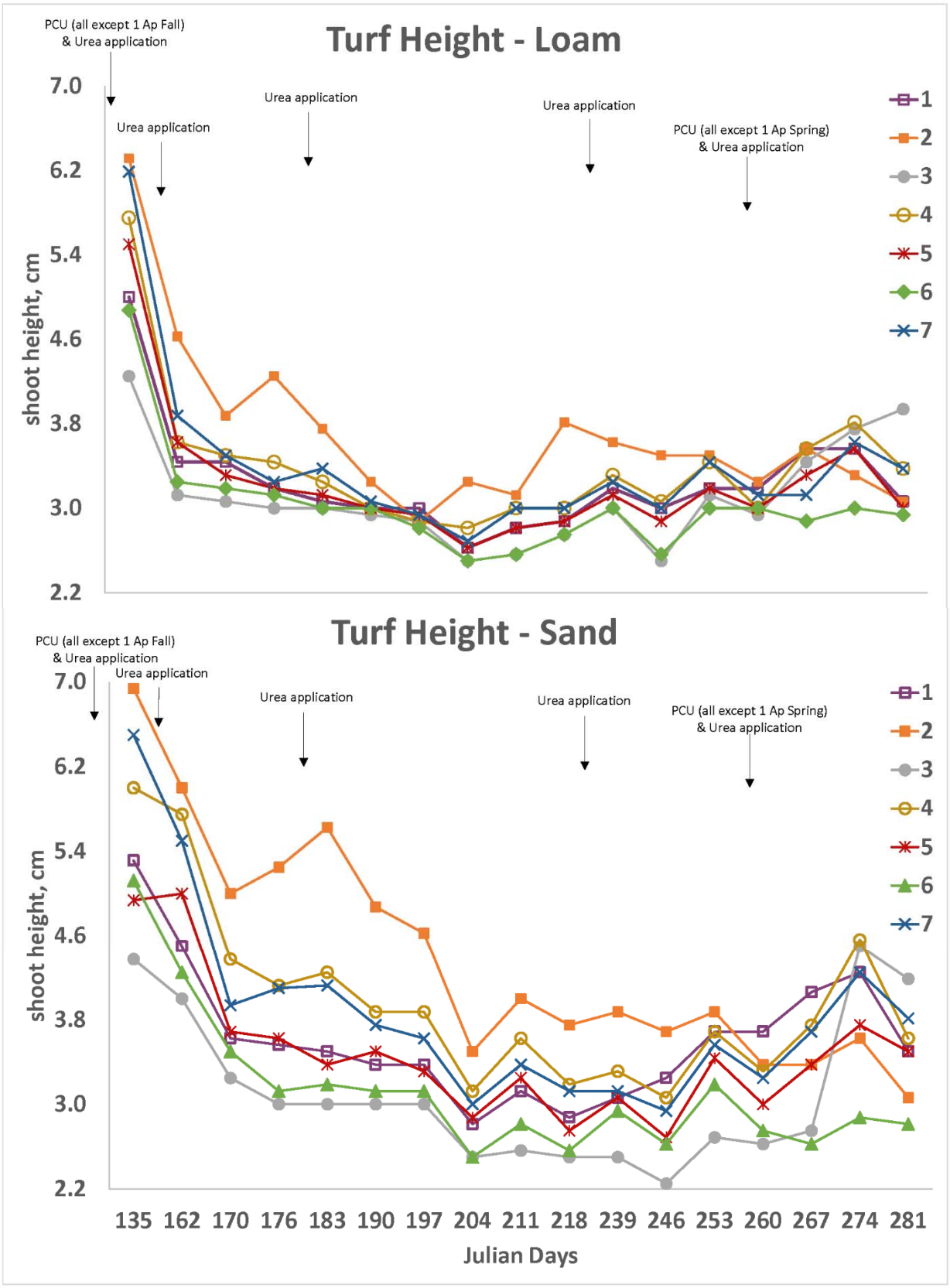

Fig. 2 a and b Weekly shoot height for Kentucky bluegrass nitrogen field studies (Table 1 for definition of treatments 1-7).

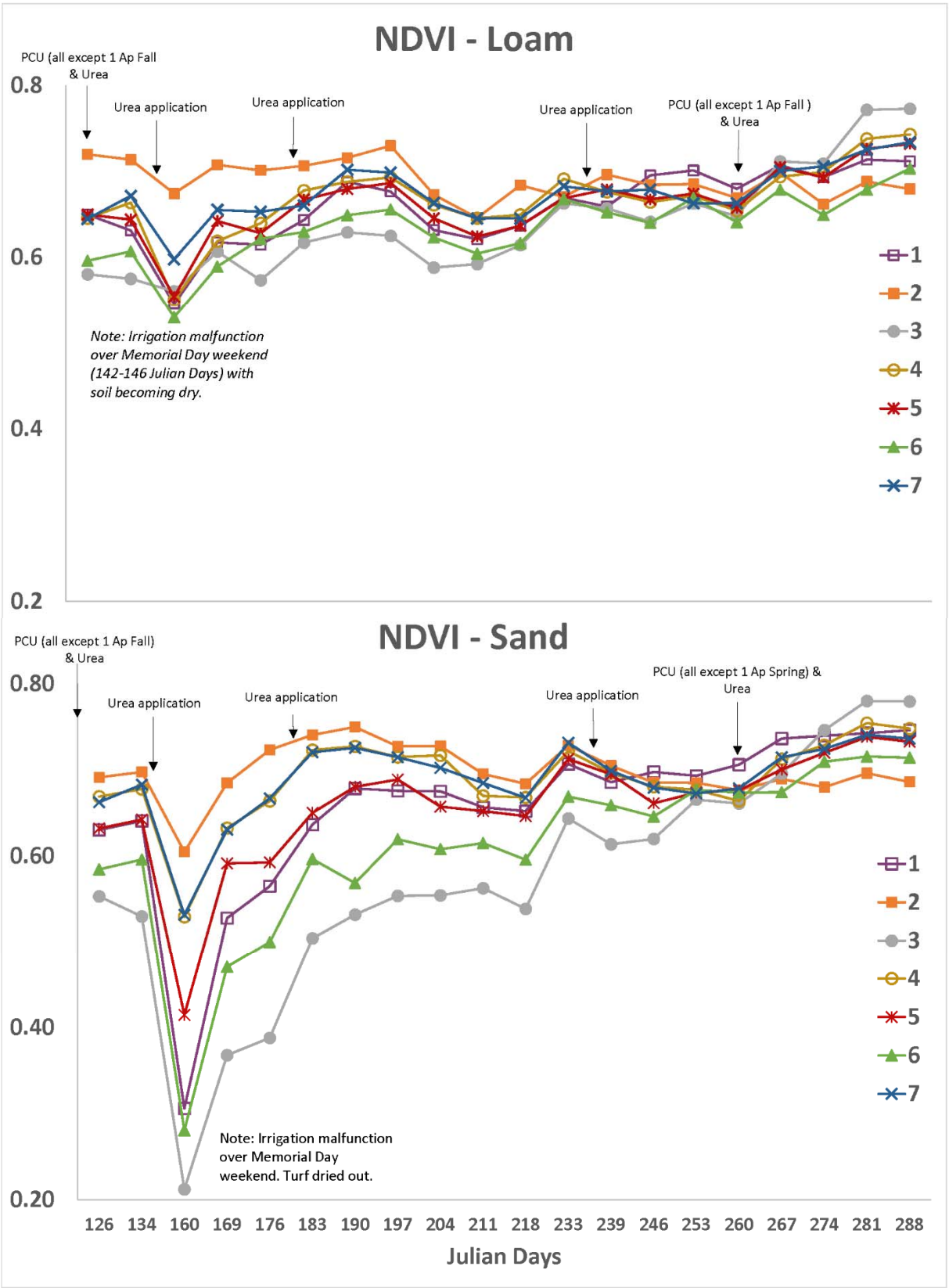

Fig. 4 a and b Weekly verdure (measured by NDVI) for Kentucky bluegrass nitrogen field studies (Table 1 for definition of treatments 1-7).

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