

Nitrogen Fertilizer Programs for Indiana Home Lawns Purdue University

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Objective:

To evaluate Purdue University's current nitrogen (N) fertilizer recommendations and investigate alternative N rates and application timings for the three most prevalent cool-season turfgrass species grown in Indiana.

Rationale:

Environmental advocates express concerns that excessive fertilizer N is being applied to home-lawns which leaches and contributes to groundwater contamination. With this in mind, Purdue University's recommendations with respect to N timing and rate are being reviewed. Furthermore, much of the information used to develop the N programs for Indiana were based on data from Kentucky bluegrass and increasing acreages of perennial ryegrass and turf-type tall fescue are being maintained. It is conceivable that depending on the turfgrass species grown, medium rooted (perennial ryegrass) vs. deep rooted (tall fescue), differences in N uptake or loss might be detected. The environmental concern lies in late-fall or early spring N applications when the turf might be less efficient in N uptake. Additionally, depending upon the homeowner's aesthetic expectations and willingness to mow, differences in annual N applications will be required. The ultimate goal of this research is to recommend environmentally responsible N programs for three turfgrass species that maximizes turfgrass performance and minimizes mowing requirements with the fewest N fertilizer inputs.

How it was done:

This field study is being conducted at the W.H. Daniel Turfgrass Research and Diagnostic Center, West Lafayette, IN. Kentucky bluegrass, perennial ryegrass, and turf-type tall fescue were seeded in 5 ft x 5 ft plots in May 2003 to evaluate their response to eight fertilizer N programs (Table 1). The eight N programs being evaluated vary in annual N rate and N timing, and range from 0 to 4.0 lbs N per 1000 ft². The programs were selected to represent a wide range of visual quality expectations and include Purdue's recommendations as well as those that may be available in garden centers. Nitrogen applications began in Sept. 2003 and will continue for several years. The two N sources being used are sulfur-coated urea (slow-release) and urea (water soluble/quick release). Sulfur-coated urea is used predominantly in spring and summer while the urea is used in fall.

Table 1. Eight potential nitrogen fertilizer programs for cool-season turfgrass lawns in Indiana.

Treatment	Sept. 10	Oct. 6	Nov. 10	April 15	May 15	July 15	Total N
1	1.0	0.0	0.0	0.0	0.0	0.0	1.0
2	1.0	0.0	1.5	0.0	0.0	0.0	2.5
3	1.0	0.0	1.5	0.0	0.75	0.75	4.0
4	1.0	1.0	1.0	0.5	0.5	0.0	4.0
5	1.0	1.0	0.0	0.0	0.5	0.0	2.5
6	0.0	0.0	1.5	0.0	0.0	0.0	1.5
7	0.0	0.0	0.0	1.0	0.75	0.75	2.5
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N Source	SCU/Urea	Urea	Urea	SCU/Urea	SCU/Urea	SCU	

The experimental plots are being maintained at 2.5 inches with a rotary mower. Seasonal mowing requirements of each species and N program is being assessed via weekly dry matter yields. A clipping sub-sample from each week's harvest is analyzed for leaf tissue N content using the LECO CHN-2000 analyzer. The impact of each N program on the aesthetic qualities of each species is being assessed using visual turfgrass quality ratings, disease incidence and severity and canopy greenness is being quantified using a hand-held chlorophyll meter.

To assess the environmental impacts of the late-fall N applications soil samples were taken from three depths (0-6, 6-12, and 12-18 inches) in early December, 2003. These samples were dried, ground and inorganic soil N extracted using a KCl extraction. The ammonium and nitrate concentrations were determined using the Lachat. Throughout the growing season, soil solution samples are being collected from each experimental plot using suction cup lysimeters located 18 inches below the soil surface. Samples are collected one week before N application, then three and ten days following. These samples are then analyzed for ammonium and nitrate concentrations.

Results to Date:

The results being presented are for autumn 2003 and are averaged across all species. Seasonal growth as clipping dry matter follows the expected pattern for cool-season turfgrasses (Figure 1). Dry matter production is higher during the warm weather in September and declines sharply during October and November. As expected, those treatments receiving N in October had higher yields compared to treatments not receiving N during this time. Similar trends occurred in tissue N contents where leaf tissue N content increased with N application (Figure 2). Tissue N contents ranged from 3 % to nearly 5 % for the heavily fertilized turf. Interestingly, N content for most programs was rather consistent at about 3.5 %. Canopy greenness increased with N applications. Again a seasonal trend of declining canopy greenness was detected as the turf began to go dormant in October and November. Those plots fertilized in October, however, retained their green color longer. Unfortunately, at the time of this report no data is available regarding soil solution N contents.

Although these results are not surprising, it will be interesting to monitor these species and N programs throughout the next few years to better determine how the various N applications affect each species.

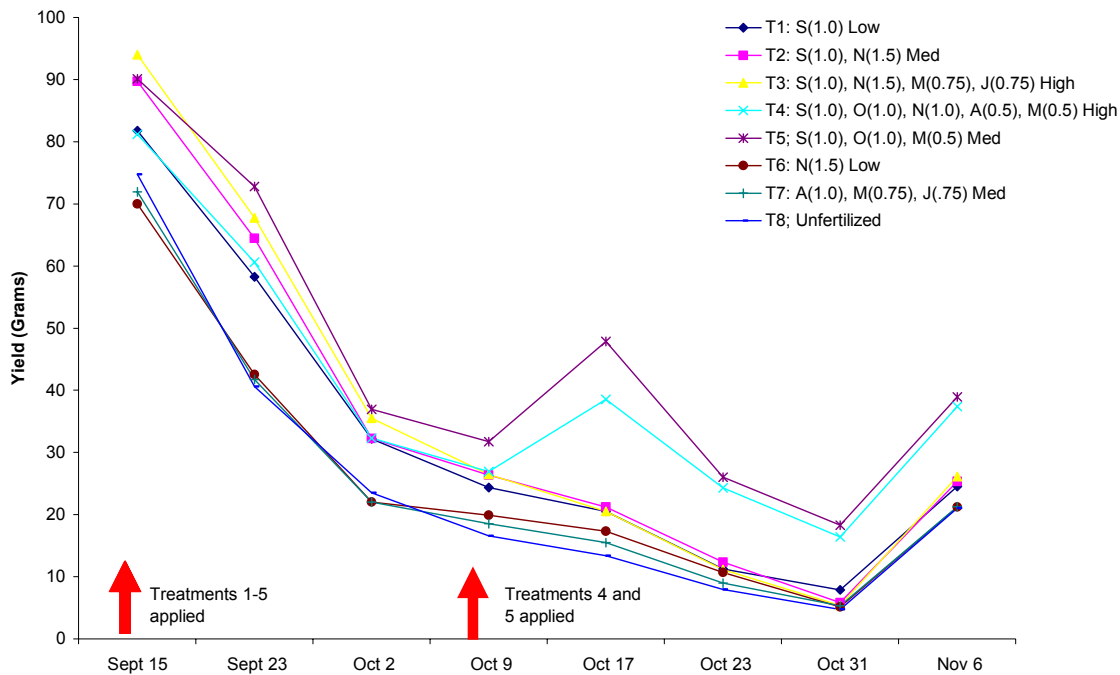


Figure 1. Clipping yields as affected by eight fertilizer programs in the autumn of 2003 (averaged over all three species).

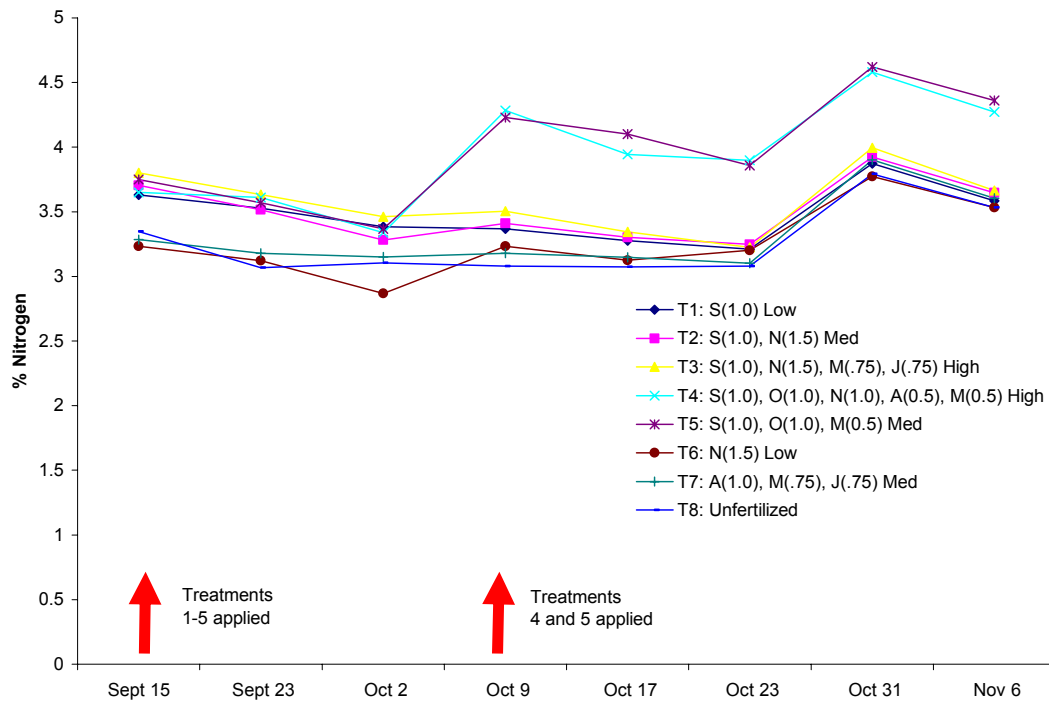


Figure 2. Percent N in turf leaf tissue as affected by eight fertilizer programs in the autumn of 2003 (averaged over all three species).

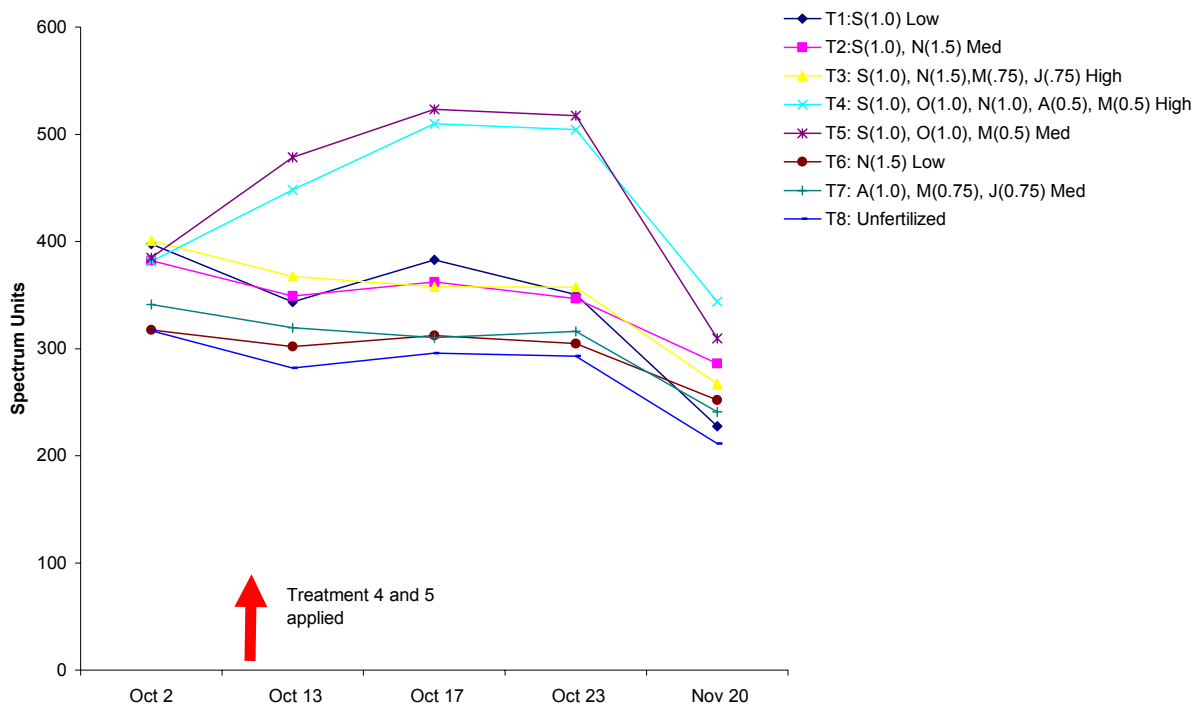


Figure 3. Canopy greenness as affected by eight fertilizer programs in the autumn of 2003 (averaged over all three species).