DETERMINING NITROGEN AND PHOSPHORUS RECOMMENDATIONS FOR TURFGRASS GROWN ON A PHOSPHORUS DEFICIENT SOIL

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Introduction & Objective

Phosphorus is a primary and essential nutrient for plant growth and routinely used as fertilizer on urban landscapes. However, one of the primary contaminants of surface water resources in Michigan is phosphorus. Reducing the loading of phosphorus from urban landscapes is a major concern for local communities as they strive to meet federally mandated total maximum daily loads for nutrients.

Turfgrass fertility programs for lawns are primarily based on the application of nitrogen while phosphorus in most cases is applied based on a pre-determined ratio of nitrogen to phosphorus. As a result, phosphorus can be applied when a soil test would suggest no applications. The attention phosphorus has garnered has certainly drawn the attention of turf professionals and led many to reduce or eliminate phosphorus from their agronomic programs relying on the assumption that soil phosphorus levels are adequate or application of phosphorus is unnecessary.

The study was conducted to determine turf response to phosphorus fertilizer programs in order to facilitate development of fertilizer best management practices for turfgrass grown on a phosphorus deficient soil.

Materials and Methods

The study was conducted for the first year of the study for 16-weeks at the Hancock Turfgrass Research Center on the campus of Michigan State University. The study will be conducted for two more years, repeatedly. The research area was located on soils testing low for phosphorus as evidenced by soil sample analysis. The sod of *Poa pratensis* L. was established on May 18, 2004 and grown

for 4-weeks. Plot size was 4×7 feet and untreated 2-foot buffers separated blocks. The nitrogen treatments are 97.65, 156.24, and 207.51 kg ha^{-1} yr^{-1}. The low, medium, and high nitrogen treatments will be applied over 2, 4, and 6 applications, respectively. Nitrogen was applied using a formulation containing 25% of slow and 75% of fast release nitrogen sources that are representative of typical home lawn fertilizers. The phosphorus treatments are 0, 24.41, and 48.83 kg ha^{-1} yr^{-1}. Phosphorus was applied using monopotassium phosphate (0-52-34) and was applied according to the application schedule for the nitrogen treatments. For the complete list, treatments were described in Table 1. Plots were watered within 48 hours after treatment. Data will be collected weekly on soil sampling and testing will be conducted monthly, and tissue NPK tests will be taken bi-weekly. Soil and plant tissue samples will be analyzed at the Michigan State University Soil and Plant Testing Lab. Data collection included weekly visual color and quality rating (scale 1 to 9), clipping yield and tissue analysis (leaf NPK content).

The experimental design was a randomized complete block design with four replications. Data were analyzed with SAS using ANOVA procedures followed by means separation of least significant differences (LSD) when appropriate.

Results

There were no significant interactions between nitrogen and phosphorus for turfgrass color, quality, or clipping dry weights (Table 2). There was a significant N rate main effect for turfgrass color and clipping dry weights from 6 to 16 weeks after treatment (WAT) (Table 3 and 5). The 208 kg N ha^{-1} rate had the highest turfgrass color and clipping weights from 10 to 16 WAT. The 98 kg N ha^{-1} rate had acceptable turfgrass color and quality ratings (> 6) throughout the first year of research (Table 3 and 4). There was no significant effect of P rate on turfgrass color and P rate was significant only one time, 10 WAT, for turfgrass quality and for clipping dry weights at 8 and 16 WAT. At 10 WAT, turfgrass quality was highest for the 208 kg P ha^{-1} rate, and not different between the two low rates.

Conclusions

First year results indicate that the low N rate treatment had acceptable color and quality ratings without high clipping yields. The high N rate treatment consistently had the highest color and quality ratings but also had very high clipping yields in comparison to the low and medium N rate treatments. Overall, there was no effect of phosphorus on color, quality, or clipping weights.

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