

Program Spotlight

Preliminary studies conducted at Cornell University have suggested certain microbial-based products have the potential to reduce overall nitrogen use.

Microbial inoculants have been shown to improve nitrogen use efficiency in agricultural crops however this has not been well documented for turf.

Preliminary Evaluation of Reduced Nitrogen Fertility with Microbial Inoculants

Introduction

Preserving water quality is a critical issue facing the golf turf industry. For many years, research has focused on the fate of pesticides and nutrients applied to turf to understand the potential risk to water quality. The majority of studies to date have concluded that when used properly, fertilizers and pesticides do not pose a significant risk to water quality.

A recent study has raised concerns regarding nitrogen leaching from a mature stand of fairway turf when high fertilizer rates are maintained. It could be inferred from this research that preservation of water quality on golf courses demands we investigate strategies to reduce nitrogen use rates while maintaining high turf quality.

Microbial inoculants have been shown to improve nitrogen use efficiency in agricultural

crops however this has not been well documented for turf. Preliminary studies conducted at Cornell University have suggested certain microbial-based products have the potential to reduce overall nitrogen use. Therefore, the goal of this project is to evaluate the effect of Advanced Microbial Solutions SuperBio SoilLife in combination with reduced rates of fertilizer on turf growth and quality.

Methodology

Two John Deere fertilizer products (8-0-8) with and without SuperBio SoilLife were applied at three rates in a completely randomized experiment with three replications (Table 1). Experimental plots (4' x 3') were established at the Cornell University Turfgrass Research Center in Ithaca, NY on a mixed stand of creeping bentgrass (*Agrostis palustris* "Putter") and annual bluegrass soil-based fairway turf (pH

Table 2. Effect of fertilizer with and without SuperBio Soil Life on turfgrass quality ratings.

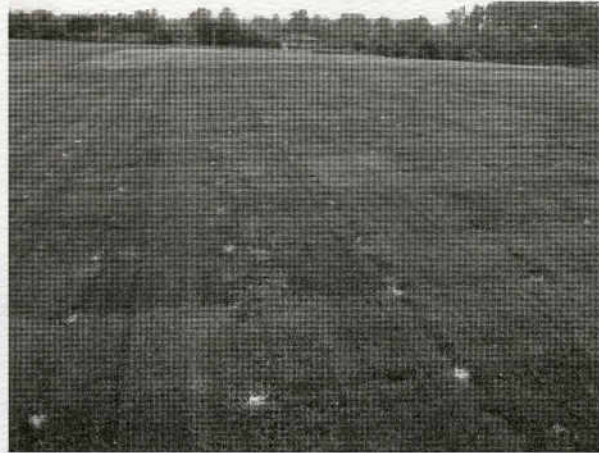
Treatment	N rate	5-Aug 5DAT	18-Aug 18DAT	26-Aug 26DAT	9-Sep 40DAT	23-Sep 54DAT	4-Oct 8DAT2	7-Oct 11DAT22	21-Oct 5DAT2
8-0-8	1	7.7	7.0	7.4	6.6	7.5	7.2	7.6	8.1
8-0-8 + SL	1	7.8	6.9	7.6	6.7	7.5	6.9	7.4	7.7
8-0-8	0.8	7.2	6.9	6.7	6.7	6.0	6.6	7.3	6.5
8-0-8 + SL	0.8	7.3	6.9	7.3	6.8	6.8	6.8	7.3	6.9
8-0-8	0.4	6.6	6.7	6.2	6.7	5.6	5.9	7.2	6.6
8-0-8 + SL	0.4	7.3	7.2	6.8	6.8	6.4	6.4	7.2	7.2
LSD (p=0.05)		0.3	NS	0.4	NS	0.3	0.3	0.2	0.2

= 6.5). The plots were mowed three times per week at 0.5 inches.

Applications of the granular fertilizers were made on August 1 and September 26. Prior to the study, the plots had received 1.5 lbs N, 0.3 lbs P and 1.5 lbs K per 1000 ft² in three applications that ended on July 1. The plots were managed to championship turf conditions with bi-weekly topdressing, regular irrigation to prevent stress and curative pest management.

Average daily temperatures for August and September ranged from a high of 79.6° F (26.4° C) and a low of 54.7° F (12.6° C). Precipitation during this period was approximately 2.3 inches below normal. The four months of June through September were the warmest such period on record, averaging 4.2 degrees warmer than normal. Precipitation was below normal; 38% of normal for July, 83% for August and 55% for September.

Data was collected for turfgrass quality on a 1 to 9 scale (where 1=poor quality turf, 6=acceptable quality turf and 9= excellent turf), clipping production and tissue nutrient content. Data analysis was conducted using linear mixed models with compound symmetric covariance structure to assess overall treatment effects when repeated measurements were made on the same experimental unit over time. Treatment



differences at individual measurement events were evaluated using analysis of variance and Fisher's protected least significant difference (LSD). The MIXED and GLM procedures in SAS/STAT software version 9.1 (SAS, Cary, NC) were used to perform the analyses.

Results

Turf Quality

In general turfgrass quality ratings remained above acceptable for the entire length of the study except for one treatment on two rating dates. The ability to maintain acceptable turf quality at 40% normal nitrogen rates when blended with Soil Life demonstrates an important response.

When averaged over the 12 weeks of the study, the 1 lb treatment with and without Soil Life had significantly higher turf quality ratings than the other two rates with and without Soil Life (see Addendum). However, the 40 and 80%

continued on page 6

Table 3. Effect of fertilizer with and without SuperBio Soil Life on clipping production.

Treatment	Clipping Wt (grams)		
	N rate	21-Sep7WAT	31-Oct5WA2T
8-0-8	1	4.8	19.6
8-0-8 + SL	1	3.4	18.5
8-0-8	0.8	3.4	19.2
8-0-8 + SL	0.8	4.8	15.9
8-0-8	0.4	3.7	18.3
8-0-8 + SL	0.4	3.3	17.5
LSD (p=0.05)		NS	NS

CUTT

Program Spotlight

The ability to maintain acceptable turf quality at 40% normal nitrogen rates when blended with Soil Life demonstrates an important response.

On almost every rating date for the lower N rate treatments, the Soil Life additions improved turf quality.



It is hard to draw strong conclusions after only one season's data.

However, we are observing a significant effect not simply of the fertilizer but of the Soil Life additions especially at reduced nutrient rates. It appears the benefit of Soil Life is not as pronounced at the higher N rates but clearly demonstrating a benefit when used with lower nutrient rates.

N treatments demonstrated a significant benefit of using Soil Life where in each case the treatment with Soil Life had significantly higher turf quality when averaged over the 12 weeks of the study.

The 1 lb. rate had significantly higher turf quality ratings independent of Soil Life at 53 days after the first treatment. In addition, turfgrass quality ratings remained significantly different throughout the latter part of the study. There was a significant separation between the 1 lb. treatment and all other treatments, but very little difference among the lower N rate treatments except on the last rating date. Still, on almost every rating date for the lower N rate treatments, the Soil Life additions improved turf quality.

Clippings

Clippings were collected seven weeks after the initial treatment, and five weeks after the second treatment. There were no significant differences among treatments on either collection date (Table 3). In addition, while clipping production on October 31 was significantly higher for all treatments than on September 21, there were no differences among the treatments when averaged over both dates.

The lack of effect of nitrogen rates on clipping production is telling albeit not consistent with turf quality responses, i.e., higher N rates typically provided higher quality. First it suggests there is a uniform growth response to all fertilizer treatments that appears to persist for up to seven weeks. More importantly however is the lack of substantial growth difference when nitrogen rate was 40%

Program Spotlight

continued from page 5



compared to 80% and the full rate treatment independent of Soil Life treatment.

Tissue Nutrient Content

There were few meaningful differences among the treatments regarding tissue nutrient content on either dates. In fact, there are no significant macronutrient differences only small differences in minor elements such as iron and aluminum on 21-September. This was surprising as one would expect an increase in nutrient uptake at higher N rates due to growth demand.

In fact, in the case of iron and aluminum the higher N rates had the lowest concentration compared to the lower N rates. Iron and aluminum are typically taken up in greater amounts under lower soil pH, however, we did not measure soil pH differences during or after the study.

Summary

It is hard to draw strong conclusions after only one season's data. However, we are observing a significant effect not simply of the fertilizer but of the Soil Life additions especially at reduced nutrient rates. It appears the benefit of Soil Life is not as pronounced at the higher N rates but clearly demonstrating a benefit when used with lower nutrient rates.

Frank S. Rossi, Ph.D.

Mary Thurn

