2016 Project Update

Project Title: **Evaluation of Nitrogen Sources, Bio-Control Products, Plant Growth Regulators, and Fairway Rolling for Dollar Spot Control**

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Introduction

This project is evaluating nitrogen sources, bio-control products and plant growth regulators for dollar spot control in conjunction with fairway rolling. This was the first of a three-year study and we hope to take the information we gathered in 2016 and improve upon next two years of data collection. We conducted three separate studies and have summarized our findings.

Objectives:

1. Determine the effect of nitrogen source on dollar spot under rolled and non-rolled conditions.
   a. Monitor thatch accumulation for all nitrogen sources.
2. Determine the effect of PGRs (paclobutrazol and trinexapac-ethyl) and nitrogen (ammonium sulfate and urea) on dollar spot under rolled and non-rolled conditions.
   a. Monitor thatch accumulation.
3. Evaluate bio-control products on dollar spot under rolled and non-rolled conditions.

Material and Methods

The trial was conducted at the University of Massachusetts, Joseph Troll Turfgrass Research Center (South Deerfield, MA) on creeping bentgrass and annual bluegrass mowed three times per week at fairway height (0.5 inches). Irrigation was provided as needed. The plot was fertilized with 17-0-17 (0.5 N/1,000 ft^2) on 13 May and rolling treatments were applied from 2 June-15 September in 2016. Rolling treatments were applied with a Smithco (Ultra 10) fairway roller twice per week (Tuesday/Thursday) and applied as a double roll to half of the overall plot. The experiment contained three separate studies, which were conducted on same the fairway. However, experimentally each study was conducted separately, since each study has a different set of data points of interest. Treatments were replicated four times in a randomized complete block design under rolled and non-rolled treatments. Individual plots measured 3' x 6' ft with a buffer strip in between replications. Dollar spot was observed at the initiation of rolling. The study was planned to start earlier, however, the rolling unit is also a demo unit and the arrival was delayed. Over the course of the study, dollar spot was assessed on a weekly basis by counting infection centers or estimating the percentage of dollar spot infection per plot. Turf quality was assessed on select rating dates. Soil organic matter in the top inch of the soil was determined to examine the effect of rolling on thatch degradation. Soil profiles were taken at the beginning of the study and at the conclusion. All green tissue was

removed and the remaining soil core was dried down and baked in a muffle furnace at 500°C to eliminate all organic matter. The difference in weight was compared to determine organic matter %. All data presented in this summary report was subject to analysis of variance (ANOVA) and when appropriate Fisher's Protected LSD was used for mean separation. A summary of data collected is provided in the Supplemental Tables provided in a separate document. A brief summary will be provided in this document based on the data collected.

Results

PGR + Nitrogen Study

This study has two main effects: rolling (4X/wk or no rolling), treatment (9 different combinations of urea, ammonium sulfate, Primo MAXX and Trimmit and untreated), and the interaction of those main effects. Overall, significant differences in dollar spot and turf quality were observed for the main effect rolling. More specifically, rolling decreased dollar spot incidence in 8 of the 11 rating dates (Table 1) and rolling improved turf quality on 5 rating dates (Table 2). The two main effects did not have any significant interactions, therefore, all treatment data includes both the rolled and no-roll data. Dollar spot incidence was very high and dollar spot infection center counts or dollar spot infection % were collected. Treatments that included Trimmit provided the greatest dollar spot reduction (Table 3 and 4) and Trimmit + Urea provided the most consistent turf quality (Table 5). Trimmit + ammonium sulfate also provided good quality, however, some phytotoxicity did occur following applications. Ammonium sulfate provided better control than urea on 6 of 11 rating dates, however, both fertilizers provided the same level of control when mixed with Trimmit (Tables 3 and 4). Primo MAXX did not control dollar spot and was statistically similar to the untreated on 9 of 11 rating dates (Tables 3 and 4). The addition of Primo MAXX to urea or ammonium sulfate had minimal impact in further reducing dollar spot (Tables 3 and 4). Samples were taken before and after the study to analyze the impact of rolling and the treatments tested. A subset of samples was analyzed and no significant differences in organic matter accumulation was observed between the before and after sample, rolled vs no-roll or treatment (untreated, urea, ammonium sulfate). Organic matter levels were low compared to golf courses we have sampled, however, we did see a slight increase in organic matter in the ammonium sulfate samples. We plan to finish the rest of the samples this winter.

Nitrogen Source Study

This study has two main effects: rolling (4X/wk or no rolling), treatment (12 different fertilizers (liquid/granular applied) and a untreated) (Table 6), and the interaction of those main effects. Overall, significant differences in dollar spot and turf quality were observed for the main effect rolling (Table 7). Rolling reduced dollar spot on 5 of 12 rating dates and improved turf quality on 3 of 9 rating dates (only significant rating dates are shown in Table 7). While this data is statistically significant, rolling provided a minimal improved in both disease control and turf quality. The two main effects did not have any significant interactions, therefore, all treatment data includes both the rolled and no-roll data. Dollar spot incidence was very high and dollar spot infection center counts or dollar spot infection % were collected. In general, all fertilizer treatments provide better control of dollar spot than the untreated, however, fertilizer sources did not shown consistent separation from each other. Similar to dollar spot data, all

fertilizer sources improved turf quality over the untreated. Calcium nitrate applied as a foliar application was the most consistent fertilizer source at improving turf quality. Organic matter samples were collected before and after the study. Visual analysis suggests little difference may exist and we plan to run select treatments over the winter.

Bio-control Study

This study has two main effects: rolling (4X/wk or no rolling), treatment (7 different bio-control treatments (liquid/granular applied) and a untreated) (Table 10), and the interaction of those main effects. Rolling had a negligible effect on reducing dollar spot in this trial. Civitas (8.0 and 17 fl oz) were the only bio-control treatments to consistently improve dollar spot control compared to the untreated, however, not to a commercially acceptable level. Civitas (8.0 and 17 fl oz) also consistently had the top turf quality among the bio-control treatments tested.

Summary Points

Overall, we were disappointed in the control observed from rolling in 2016. We observed far greater reductions in 2015. We are speculating that rolling needs to occur begin earlier in the season and as a preventative treatment. Dr. Jung was on sabbatical and conducted two rolling studies in Japan and South Korea. He observed a similar dollar spot reduction to the 2015 study. The common tie between the successful 2015 study and Japan/South Korea was rolling timing. All successful studies began rolling 4-8 weeks before dollar spot was observed. In 2016, rolling was initiated less than 7 days before dollar spot infection was observed. Based on past observations, this would suggest that beginning a rolling program in early May would protect from any early season epidemics. We plan to initiate rolling earlier next year to avoid any confounding effects. Despite a limited impact from rolling we did see good control of dollar with Trimmit and tank-mixed with urea and ammonium sulfate. Furthermore, urea and ammonium sulfate did show a reduction in dollar spot when applied alone