

Dollarspot suppression by fertility programs on creeping bentgrass fairway turf

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The objective of this research project was to determine the effects of the sponsor's fertilizer programs on dollarspot disease and general performance of creeping bentgrass putting green turf maintained at fairway height.

Data collected included the duration and strength of the color response following application(s) of the tested products, turf quality, uniformity, and density, and resistance of the turf to disease and drought stress

MATERIALS/METHODS

The trial included three treatments (fertility programs as per Table 1). An unfertilized check treatment was also included. Treatments were applied to 1 x 2 m plots of creeping bentgrass turf maintained as a fairway at the Guelph Turfgrass Institute (mowing at 10 mm, irrigation to prevent stress). Treatments were replicated four times in a randomized complete block design. Granular treatments were applied by hand with a shaker applicator; micronutrients were tank mixed and applied with a compressed air sprayer.

Color response of the turf to treatments was assessed regularly using canopy reflectance (normalized-difference vegetation index). Uniformity of the color response was assessed visually. Plots were rated regularly for turf quality, density and uniformity. Dollarspot inoculum was added (5 g m^{-2}) to half of each plot on Aug. 29 and to the second half on Sept. 11 to ensure a uniform

source for dollarspot disease. Spring greenup will be assessed in April 2009.

All data were analysed statistically using the SAS package of statistical software.

An anecdotal photographic record was kept of the progress of the trial.

RESULTS

Turf performance – visual ratings. Visual quality ratings of treated plots indicated high quality turf throughout most of the trial period, though by 7 weeks after the first treatment, the dollarspot disease infestation in the Clubgreen and untreated plots was reducing the quality compared to the TruPrill treatments (Table 2).

Turf performance – canopy reflectance. The canopy reflectance data showed a very similar pattern to the visual quality data, with significant differences among the treatments on all observation dates (Table 3). The values of the NDVI were very close among all the treatments, but the two TruPrill treatments had higher absolute index values (Figure 2). When the data were corrected to remove the background variation (by subtracting the control plot means), the treatment response became more evident (Figure 3). The two applications for the TruPrill treatments resulted in a clear response to the second application, in comparison to the single application of the Clubgreen.

Table 1. Dollarspot disease suppression trial: treatments

Treatment	Product rate	Program
1 Granular Tru-prill 17-0-15	14.4 g m^{-2}	Aug. 22, Sept. 19
2 Granular Tru-prill 17-0-15 + Protocal + ENFOS	14.4 g m^{-2} + 0.25 ml m^{-2} + 1.6 g m^{-2}	Aug. 22, Sept. 19 Sept. 5, Sept. 18, Oct. 5 Sept. 5, Sept. 18, Oct. 5
3 Clubgreen 16-4-20	15.3 g m^{-2}	Aug. 22
4 Control	—	—



Figure 1. Plot area September 4, 2008

Table 2. Visual quality ratings of treated plots.

Treatment	Days after first treatment application			
	12	18	28	48
TruPrill+	8.5 ^a	8.3	8.0	8.5 a
TruPrill	8.5	8.0	8.5	9.0 a
Clubgreen	8.3	8.0	8.5	7.5 b
Control	8.0	7.3	7.8	7.0 b
lsd p=0.05	NS	NS	NS	0.63

^a Visual rating 0-10, 6=acceptable. Means of 4 replicates; means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

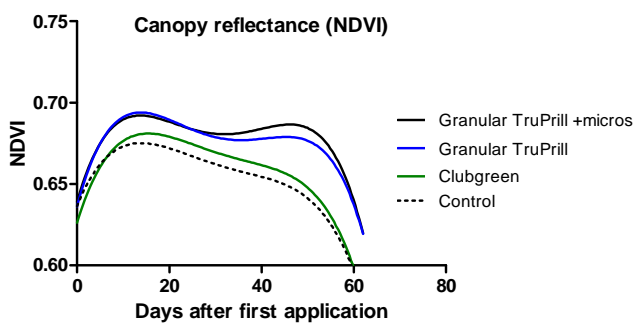


Figure 2. NDVI measurements in treated plots. Curves are fourth order polynomials fitted to plot means (R^2 values vary from 0.39 [granular TruPrill] to 0.60 [Clubgreen])

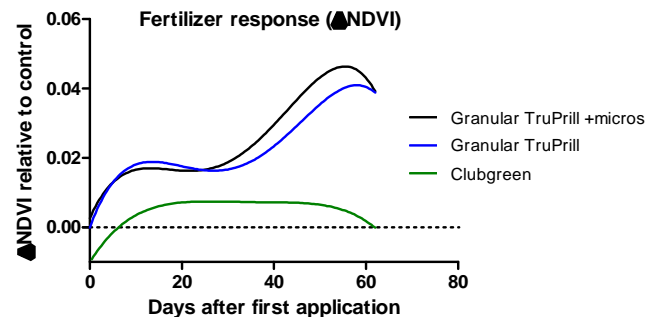


Figure 3. Fertilizer response as estimated by NDVI measurements in treated plots, corrected to remove background variation (Control=0). Curves are fourth order polynomials fitted to plot means (R^2 values are 0.14 [Clubgreen], 0.31 [TruPrill], and 0.52 [TruPrill + micros]).

Table 3. Canopy reflectance in treated plots.

Treatment	Days after first treatment application										
	0	1	2	3	4	5	6	7	8	9	10
TruPrill+	0.621 a ^c	0.645 a	0.664 b	0.688 b	0.670 b	0.665 a	0.683 a	0.682 a	0.686 a	0.689 b	0.678 b
TruPrill	0.603 c	0.644 a	0.668 a	0.693 a	0.677 a	0.663 a	0.685 a	0.678 b	0.688 a	0.695 a	0.687 a
Clubgreen	0.612 b	0.634 b	0.647 c	0.678 d	0.652 d	0.646 b	0.660 b	0.665 c	0.673 b	0.674 c	0.666 c
Control	0.609 b	0.647 a	0.666 ab	0.683 c	0.660 c	0.646 b	0.663 b	0.661 c	0.668 c	0.672 c	0.663 d
lsd p=0.05	0.005	0.0041	0.0044	0.0036	0.0038	0.0039	0.0039	0.0039	0.0036	0.0036	0.0032
	11 ^a	11 ^b	12	13	14	15	17	18 ^a	18 ^b	19	20
TruPrill+	0.703 a	0.693 a	0.691 a	0.702 a	0.711 b	0.675 b	0.691 a	0.710 a	0.700 a	0.684 a	0.659 a
TruPrill	0.697 b	0.692 a	0.691 a	0.699 a	0.716 a	0.681 a	0.681 b	0.712 a	0.698 a	0.681 a	0.657 a
Clubgreen	0.690 c	0.678 b	0.681 b	0.693 b	0.699 c	0.677 b	0.678 b	0.701 b	0.692 b	0.676 b	0.649 b
Control	0.681 d	0.672 c	0.676 c	0.687 c	0.693 d	0.666 c	0.670 c	0.689 c	0.682 c	0.673 b	0.649 b
lsd p=0.05	0.004	0.0039	0.0031	0.0035	0.0032	0.0034	0.0031	0.0031	0.0033	0.0038	0.0039
	21	24	25 ^a	25 ^b	26	27	28 ^a	28 ^b	31	32 ^a	32 ^b
TruPrill+	0.678 b	0.694 a	0.677 b	0.675 a	0.668 a	0.677 a	0.673 a	0.670 a	0.684 a	0.688 a	0.689 a
TruPrill	0.682 a	0.691 a	0.682 a	0.675 a	0.667 a	0.679 a	0.676 a	0.671 a	0.680 a	0.686 a	0.683 b
Clubgreen	0.670 c	0.679 b	0.664 c	0.661 b	0.657 b	0.669 b	0.660 b	0.665 b	0.672 b	0.676 b	0.672 c
Control	0.667 c	0.674 c	0.658 d	0.655 b	0.650 c	0.663 c	0.658 b	0.660 c	0.666 c	0.668 c	0.667 d
lsd p=0.05	0.0029	0.0042	0.005	0.0055	0.005	0.0051	0.0048	0.0045	0.0039	0.0038	0.0041
	33	34	35 ^a	35 ^b	38	40	42	45 ^a	45 ^b	48	49
TruPrill+	0.683 a	0.680 a	0.695 a	0.691 a	0.711 a	0.684 a	0.691 a	0.693 a	0.695 a	0.670 a	0.644 a
TruPrill	0.674 b	0.678 a	0.688 b	0.674 b	0.710 a	0.686 a	0.690 a	0.689 a	0.685 b	0.668 a	0.633 b
Clubgreen	0.665 c	0.663 b	0.677 c	0.671 b	0.688 b	0.664 b	0.674 b	0.663 b	0.663 c	0.644 b	0.616 c
Control	0.659 d	0.654 c	0.668 d	0.662 c	0.679 c	0.660 c	0.659 c	0.648 c	0.651 d	0.638 c	0.615 c
lsd p=0.05	0.0044	0.0041	0.0046	0.0051	0.0044	0.0038	0.0048	0.0047	0.0051	0.0041	0.0061
	53 ^a	53 ^b	54	55	62	Mean					
TruPrill+	0.680 a	0.679 a	0.673 a	0.682 a	0.624 a	0.680 a					
TruPrill	0.671 b	0.666 b	0.665 b	0.672 b	0.627 a	0.678 b					
Clubgreen	0.635 c	0.636 c	0.632 c	0.634 c	0.586 b	0.663 c					
Control	0.634 c	0.634 c	0.630 c	0.631 c	0.584 b	0.659 d					
lsd p=0.05	0.0059	0.0059	0.0055	0.0053	0.0058	0.0008					

^a Pre-mowing measurements.

^b Post-mowing measurements

^c Normalized-difference vegetation index (0-1); higher values indicate better turf quality, color, N status. Means of ~50 readings x 4 replicates; means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

The uniformity of the turf can be assessed by examining the coefficients of variation of the NDVI values. Generally the uniformity of the turf increased (coefficients of variation were reduced) as the NDVI values increased across the

trial period, and the TruPrill treatments were more uniform. Towards the end of the trial, as the dollarspot infestation increased and turf quality declined, the control and Clubgreen treatments became much less uniform (Figure 4).

Table 4. Dollarspot infection in treated plots.

Treatment	Days after first treatment application				
	12	18	28	38	42
	DS rating	DS lesion count			
TruPrill+	0.05 ^a	5.8 ^b	11.3	5.0 b	8.3 b
TruPrill	0.00	3.5	11.5	3.5 b	10.0 b
Clubgreen	0.05	8.8	20.0	22.0 a	37.5 a
Control	0.08	9.5	23.8	24.5 a	49.8 a
lsd p=0.05	NS	NS	NS	13.4	22.9

^a Visual rating 0-10, 0=no infection.

^b Count of dollarspot lesions per 2 m² plot.

Means of 4 replicates; means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

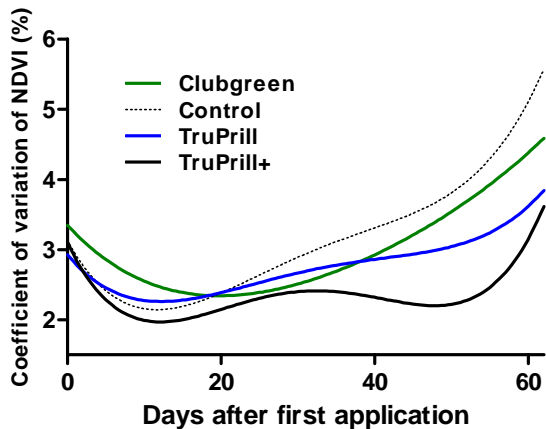


Figure 4. Uniformity of plots as estimated by coefficients of variation of NDVI measurements. Curves are fourth order polynomials fitted to plot means.

Dollarspot disease. There was a little bit of dollarspot across all treatments in the first two weeks after the first application (Table 4). By three weeks after the start of the trial, the trend in dollarspot disease presence was clear, with less dollarspot present in the two TruPrill treatments than in the control or Clubgreen treatment (Figure 5). By 5 weeks after the start, the pattern was statistically significant.

DISCUSSION AND CONCLUSIONS

There were consistent and significant differences among the treatments in turf quality and resistance to dollarspot disease. Generally the two TruPrill treatments were significantly better quality and had much less dollarspot disease than either the Clubgreen treatment or the control. There was a slight enhancement of performance of the treatment with micronutrients, but it was not significantly different in many cases. The Clubgreen treatment



Figure 5. Typical dollarspot disease symptoms in untreated check plot, October 3, 2008.

had higher quality than the control early in the experiment, but the improvement had disappeared by the end of the experiment.

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