Project name: Evaluation of nematode populations and nematode damage
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Principal Investigators: Larry Stowell, Ph.D. and Wendy Gelernter, Ph.D., PACE Turf

Summary

The objective of this survey was to determine the threshold number of nematodes per 100 cc of soil that will result in turfgrass performance problems on the bentgrass greens at La Jolla Country Club. The threshold values are important because the only commercially nematicide, Nemacur, is no longer manufactured and it will become unavailable once the distribution network is depleted. There are no alternative nematicides currently on the market or near market introduction. If nematodes are below the damage threshold, no treatment will be needed. However, if nematode populations exceed damage thresholds, turf performance will suffer.

We found that areas of turf that were visually identified as poor vs. good did indeed have significant differences in turf quality, as measured with the CM 1000 chlorophyll meter. However, there were no differences in soil chemistry, soil moisture or plant disease incidence that were responsible for this difference. Most importantly, there was no evidence that nematodes were responsible for these quality differences either. The survey indicates that although three different nematode species were present (*Criconemella* or ring nematode, *Meloidogyne* or root knot nematode and *Helicotylenchus* or spiral nematode), only spiral nematode levels exceed current threshold values and that there was no correlation between nematode population and turfgrass performance. Combined, this information suggests the existence of damaged turf is not related to nematodes and it is more likely related to high temperature and moisture stress during an unusually hot period of time.

Published nematode threshold values may be of limited value in determining the cause of turf damage, with the exception of the extremely damaging sting nematode and leaf gall nematode. For these two parasites, exceeding threshold values is consistently associated with turf damage. In the case of other nematodes, however, exceeding published threshold values does not necessarily result in turf damage. This is partly due to the fact that healthy turf plants, with their extensive root systems, are able to support higher populations of nematodes without any signs of visible damage. As a result, nematode numbers alone should not be a trigger for treatment with nematicidal materials. Instead, an evaluation of all potential causes of observed turf damage is necessary before nematodes can be identified as the culprits.

Materials and Methods

Good and poor performing areas were visually identified on each of 18 bentgrass greens. Turf quality in each of these areas was quantified using the CM 1000 chlorophyll meter (Spectrum Technologies). For each area, the mean of three separate turf quality ratings was calculated. Additional data taken on each sample included volumetric soil moisture (as measured with Spectrum's TDR 3000 moisture meter) and soil electrical conductivity (as determined by the Spectrum Field Scout EC meter).

To assess nematode populations, a cup cutter sample was taken from each of the 18 good and 18 poor performing areas. The depth of each sample was 4 inches. Each sample was then cut in half vertically, so that one half could be analyzed for nematode populations and the other for soil chemistry. Nematode analyses were conducted by Dr. Michael McClure, University of Arizona, and soil chemistry analyses by Brookside Labs, New Knoxville, OH.

All field and laboratory analyses were conducted in August, 2007.

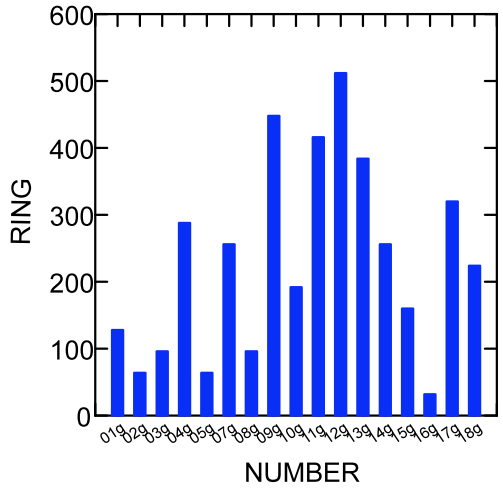
Results

Table 1. Average nematode levels and turf quality (CM1000 index) value for good and poor performing greens

The average turf quality rating (as determined by the C 1000 chlorophyll meter) was 282 for good performing greens, and 242 for poor performing greens a significant difference using analysis of variance (Fisher's Protected LSD $p<0.001$). None of the nematode population values from the good vs. poor performing areas were significantly different even at a low significance level of $p<0.1$.

	Good Area	Poor Area	PACE Threshold
CM1000 Turf Quality	282 a	242 b	
***Criconemella* (Ring)/100 cc soil**	231 a	168 a	700
***Meloidogyne* (root knot))/100 cc soil**	667 a	885 a	2000
***Helicotylenchus* (spiral))/100 cc soil**	1668 a	1264 a	2000
Total	2566 a	2317 a	

Figure 1. Nematode levels in good performing samples. PACE damage threshold levels for ring nematode (*Criconemella*) is 700 larvae/100 cc soil, root knot nematode (RKN) (*Meloidogyne*) is 2000 larvae/100 cc soil, and spiral nematode (*Helicotylenchus*) is 2000 larvae/100 cc soil.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50-59
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110-119
120-129
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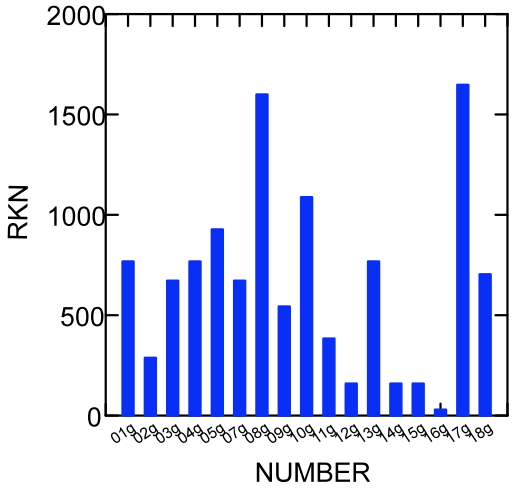
140-149
150-159
160-169
170-179
180-89
NUMBER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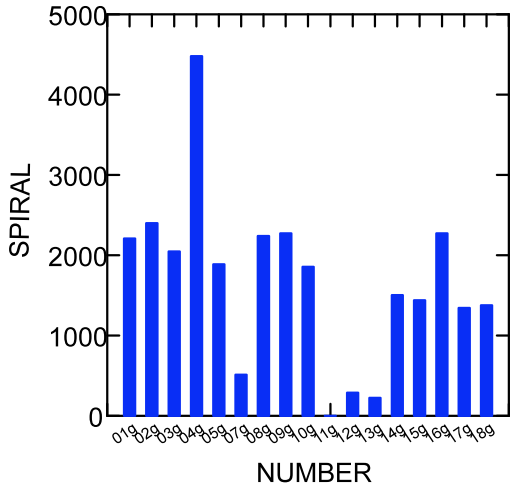
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180-89
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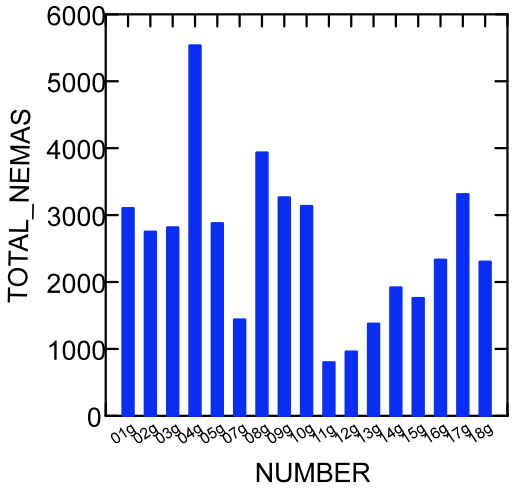
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90-99
100-109
110-119
120-129
130-139
140-149
150-159
160-169
170-179
180-89
NUMBER

Figure 2. Nematode levels in poor performing samples. PACE damage threshold levels for ring nematode (*Criconemella*) is 700 larvae/100 cc soil, root knot nematode (RKN) (*Meloidogyne*) is 2000 larvae/100 cc soil, and spiral nematode (*Helicotylenchus*) is 2000 larvae/100 cc soil.

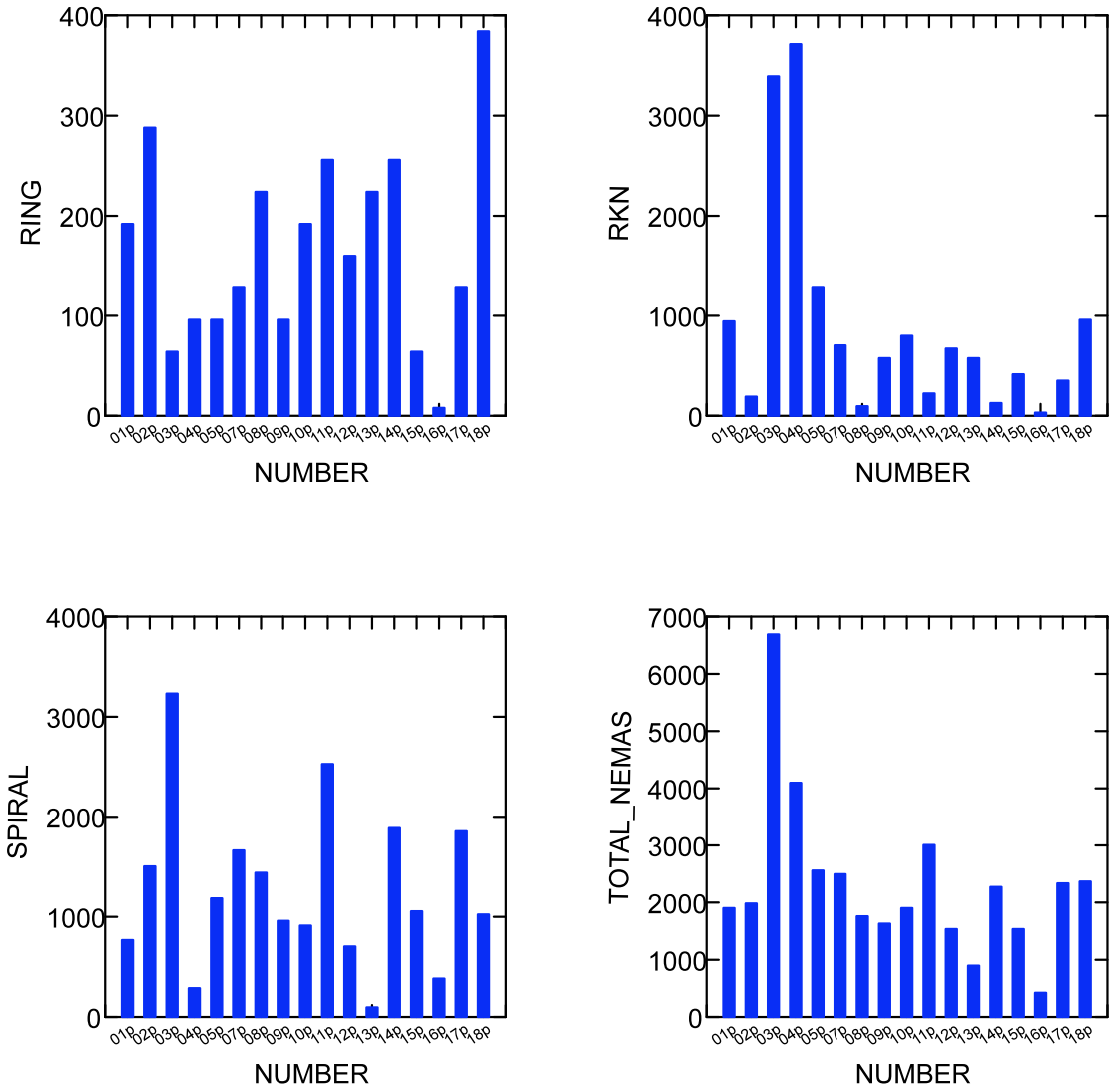

Figure 3. Turfgrass quality for good performing areas evaluated using the CM1000. The target CM1000 chlorophyll index value is above 300 for good turfgrass color and density.

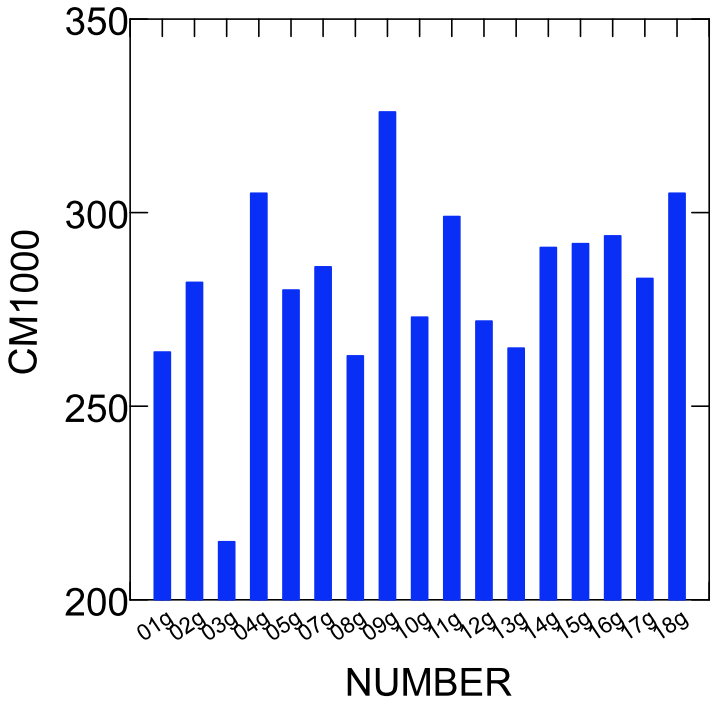

Figure 4. Turfgrass quality for poor performing areas evaluated using the CM1000. The target CM1000 chlorophyll index value is above 300 for good turfgrass color and density.