1. Project Title.
   Development of management programs for root decline of warm-season grasses and root-knot nematodes in ultradwarf bermudagrass greens

2. Nathan R. Walker
   Oklahoma State University, Department of Entomology and Plant Pathology
   Address: 127 Noble Research Center, Stillwater, OK 74078-3033
   Phone: 450-744-6830
   E-mail: Nathan.walker@okstate.edu

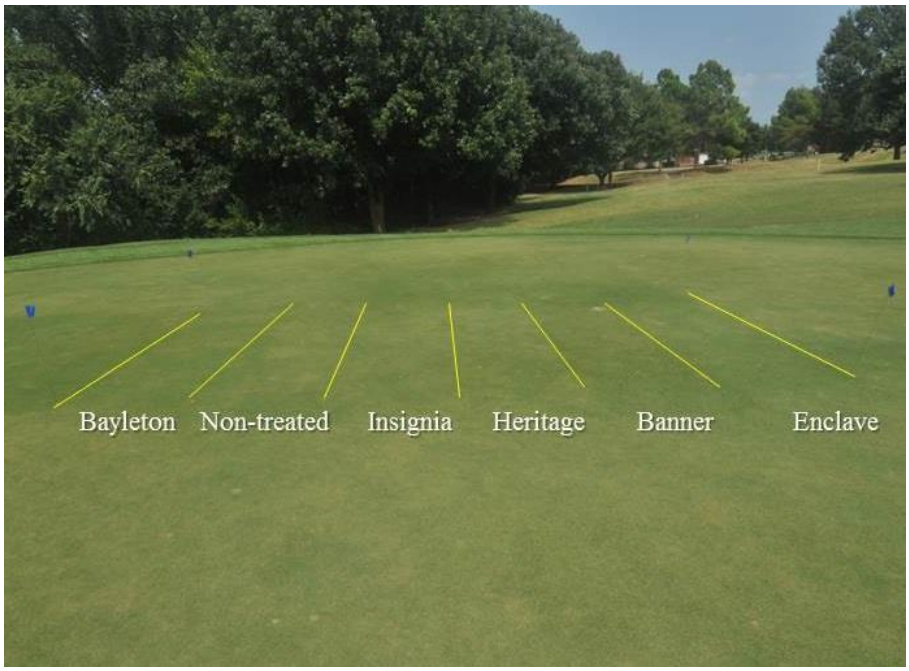
In recent years due to high summer temperatures and the challenges associate with maintaining bentgrass putting greens, some golf courses in the transition zone have converted to ultradwarf bermudagrass greens (UDB). Recently, UDB greens in Oklahoma that experienced damage from cold temperatures were characterized as having poor rates of growth and recovery. Root-knot nematodes, root decline of warm-season grasses, or both often were present. The objective of the research was to identify effective management programs for both root-knot nematode and root decline for ultradwarf bermudagrass greens. An UDB green located in central, OK was be used for this study. This location had established root-knot nematode (*Meloidogyne marylandi*) and root decline (*Gaeumannomyces graminis* var. *graminis*) (Fig 1) pathogens. Fungicide applications were made in the spring when soil temperature at a 2-inch depth averaged over five days was greater than 55°F. The fungicides: Heritage 50WG (azoxystrobin, Syngenta Professional products), Banner Maxx 1.3 MEC (propiconazole, Syngenta Professional products), Insignia 20 WG (pyraclostrobin, BASF Specialty Products), Bayleton 50 WG (triadimefon, Bayer Environmental Science), and Enclave 5.3 SC (chlorothalonil, iprodione, thiophanate-methyl + tebuconazole, Nufarm Americas) were all applied at the highest label rate to 3 ft by 9 ft plots on April 8, 29, & May 20, 2015 using a CO_2 pressurized wheeled sprayer equipped with TX8008 flat fan nozzles and calibrated to deliver 87 GPA or 2 gal/1,000 sq ft. Non-fungicide treated plots served as a control. Perpendicular to the fungicide treated plots two experimental nematicides were applied to 3 ft by 18 ft plots. One nematicide was applied on the same dates as the fungicides using the same equipment. The second granular nematicide was applied on May 26 and June 23 using a Gandy drop spreader. Immediately following all treatments plots were overhead irrigated with approximately 1/4 inch of water. Non-nematicide treated plots served as a control. The plots were arranged in a randomized complete block strip plot design with four replications. On 18 August, plots were evaluated using a FieldScout TCM 500 NDVI Turf Color Meter (Spectrum Technologies, Plainfield, IL) to determine turfgrass quality. Five, 1 inch diam. by 2 inch in depth soil cores were taken from each nematicide treated plot both at the start of the study and on 18 August. Soil samples were processed using bucket-decanting, centrifugal floatation to determine the populations of nematodes present. Additional soil cores were taken from each sub-plot and root systems were evaluated for color and rooting depth.

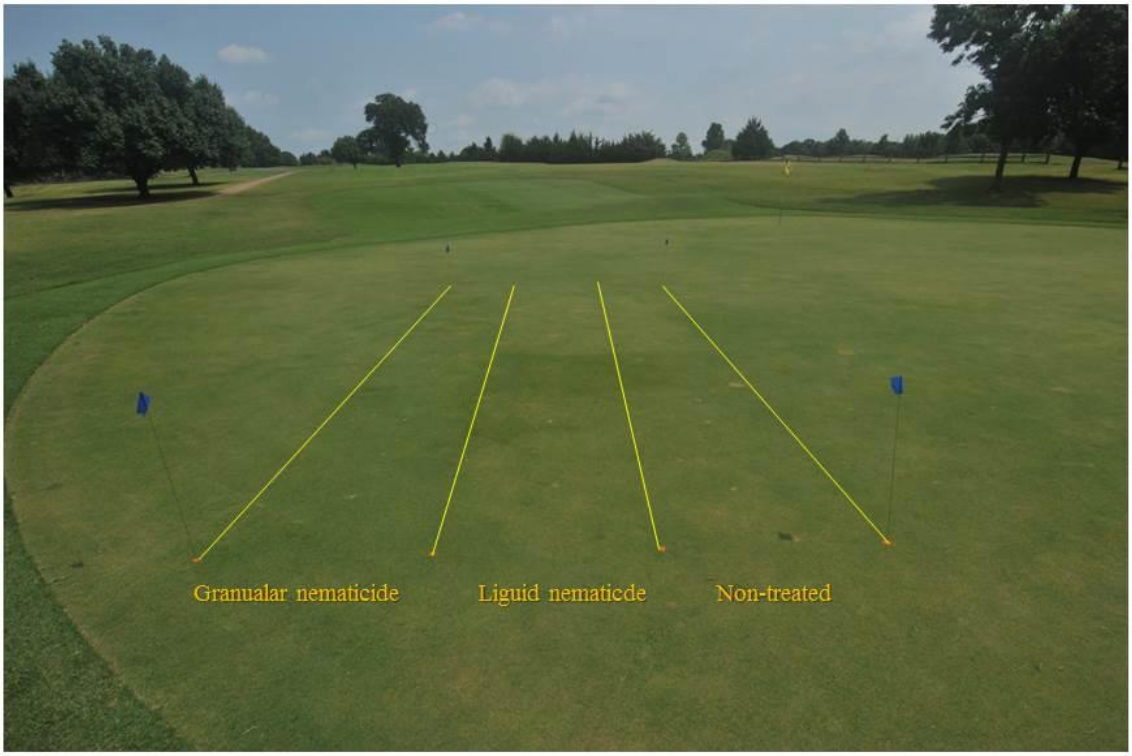
No differences in root-knot or lance nematodes populations were present at the start of the trial (Table 1). Across the four replications there were considerable differences in both fungicide and nematicide treatment effects. This may be due to the patchiness of nematode populations. A reduction in root-knot nematodes was present for the liquid applied nematicide but it was not significant. Plots treated with this product had statistically higher lance nematodes possibly suggesting reduce root-knot nematode competition permitted greater lance numbers. No differences were observed for root length and color and both nematicides significantly increased turfgrass quality; however, the increases were not large. Despite plots in some replication having better visual quality there was no consistant effect of the fungicides. The results of this study suggest more research should be conducted on application timing, rates, and the number of applications of the fungicides and nematicides evaluated.

Table 1. Effects of two experimental nematicides on nematode populations and ultradwarf bermudagrass quality.

	April 8, 2015		August 18, 2015		
Treatment	Root-knot	Lance	Root-knot	Lance	Turfgrass quality
Non-treated	64	23	96	9 b*	7.93 b
Liquid Nematicide	60	21	31	36 a	8.06 a
Granular Nematicide	66	13	94	6 b	8.11 a

*Means followed by the same letter in each column are not significantly different based on Fisher's protected least significant difference test at $P \leq 0.05$.


Bayleton
Non-treated
Insignia
Heritage
Banner
Enclave


Granualar nematicide
Liguid nematicde
Non-treated