Stop #3: The Proof of the Pudding is in the Eating

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The Pacific shoot-gall nematode *Anguina pacificae* is a serious pathogen on annual bluegrass (*Poa annua*) on golf courses along the Northern California coast (McClure et al., 2008). The disease symptoms manifest as conspicuous galls at the grass shoot base. The galls may contain all development stages of the nematode such as eggs, juveniles and adults. Infected plants may die or branch into several shoots that often become infected and stunted. Putting greens become patchy and bumpy under severe disease pressure.

Considerable effort has been devoted to the development of effective management strategies against *A. pacificae* (Westerdahl et al., 2005). More recently, 29 products were screened in a bioassay for efficacy against the nematode (McClure and Schmitt, 2012). Of those, 8 products showed some degree of control but only 4 were registered for use on golf course greens. Two botanical products tested were Neem-based with the active ingredient azadirachtin, a triterpenoid with known activity against certain insects. The authors suggested that the products should be applied every 14 days throughout the season (March to October). Several golf courses with severe *A. pacificae* problems have been following that recommendation. The objective of our trial was to evaluate the efficacy of biweekly Neemix 4.5 treatments by monthly monitoring of three different plant parasitic nematode populations and visual turf vigor ratings compared to the non-treated control. In addition, after 4 months Anguina shoot-gall symptoms and *P. annua* plant weight were determined.

Materials and Methods

The trial was performed on a nursery putting green at the Pebble Beach Golf Links on the Monterey peninsula. In addition to *A. pacificae*, the green was fairly uniformly infested with *Helicotylenchus* sp. (spiral nematodes) and *Mesocriconema* sp. (ring nematodes). The trial was installed mid-April and will continue until mid-September 2014. The experimental design was a complete randomized block design with 4 replications and 4 x 6 ft plots. Neemix 4.5 was applied at 9 oz/1,000 ft^2 in 14-day intervals. Three turf cores (7/8-inch diameter, 6 inch deep) per replication were collected at the middle of each month, pooled into a plastic bag and analyzed in the lab for nematode population density. At the same time, each plot was evaluated for performance by visual vigor ratings. At the last sampling date, plant weight and number of shoot galls were determined.

Results

Preliminary results indicate that none of the plant parasitic nematode populations differed significantly between the non-treated control and Neemix 4.5 treatment during the 4-month monitoring period. Likewise plant health, indicated by monthly visual turf ratings, fresh weight determination of turf cores and number of shoot galls after 4 months were not significantly affected by the Neemix 4.5 treatment.

Discussion

The results demonstrate that laboratory bioassays do not necessarily reflect efficacy under outdoor conditions. Previous reports about in vivo activity of Neem products against various plant parasitic nematodes have been inconsistent at best (Crow, 2005, Ntalli et al., 2009). Applying any pesticide frequently in short intervals should be considered poor practice as it increases the chance for developing pest resistance and/or accelerated biodegradation of the active ingredient. It should also be noted that Neemix 4.5 has been advertised only as an insect growth inhibitor. The company's web site does not cite activity against nematodes.

The take-home message is that for any pest management treatment it should be standard operating procedure to include non-treated controls. The efficacies of turf treatments against plant parasitic nematodes are difficult to evaluate but become impossible without suitable controls for comparison.

Literature

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