PROFILING ROOT LESION NEMATODE PESTS OF CORN

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There is a renewed interest in nematode pests of corn. Even as producers fine-tune fertility and cultural practices such as planting date and plant density, yields fail to reach the genetic potential of new cultivars in some fields. In many cases, nematodes are a major contributor to stagnant or declining yields. There is an industry push to bring new nematicides to market, so producers who are knowledgeable about nematodes will be positioned to take advantage of new technology and products.

Root lesion is the most common nematode pest of corn in Wisconsin. Surveys conducted in 1999 and 2007 showed more than 95% of corn fields positive for root lesion nematodes, *Pratylenchus* spp. The severity of the infestations, as measured by population densities of nematodes, increased in the eleven years between surveys. In 2007, more than 25% of the fields were above the damage threshold for root lesion nematodes. This observation has been made across the North Central region of the U.S. Some have speculated reasons for this increase, including the loss of broad-spectrum insecticides with nematicidal activity, a shift in rotations, and the adoption of reduced tillage regimens.

In 2008, we demonstrated the damage potential for one root lesion nematode species, *P. penetrans*, by studying 25 locations in a corn field. Soil samples were collected soon after planting and right before harvest. Root samples were collected six times during the growing season. Population densities of nematodes 17 days after planting (corn growth stage V-1) were significantly correlated with grain yield and seed test weight. Yields were reduced more than 20% at locations in the field with population densities greater than 200 root lesion nematodes per 100 cc soil.

Root lesion, like other nematode pests, rarely disappear from an infested field and should be considered a site characteristic. Nematodes are distributed throughout the soil profile and occur where ever corn roots grow so some can escape the lethal effects of tillage or pesticides. Root lesion nematodes have an extremely wide host range that includes soybeans, grains, vegetables, and weeds so there is always food available to the population.

Fields are at risk when nematode population densities are high. Factors that encourage the build-up of root lesion nematode population densities include susceptible hosts and favorable climates. The most important factor is adequate, but not excessive soil moisture. As animals, nematodes can escape zones of unfavorable conditions, but population densities rise rapidly when soil factors become conducive. All infested fields are at risk for nematode damage.

Estimating population densities of root lesion nematodes is based on census data collected by soil sampling. A bulk sample composed of many soil cores is used to profile populations at the field scale. The protocol for sampling is similar to that used for soil fertility tests. Samples can be collected at any

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time of the year. For the purposes of managing root lesion nematodes, the goal is to estimate the size of the nematode population at the start of the corn crop. Most often, this is accomplished by projections that account for the time of year the sample was collected.

The most important factors for obtaining an accurate estimate of nematode populations are where in the field to collect soil cores and how many cores to collect. Our lab has studied the spatial distribution of root lesion nematodes in commercial fields, including one field sampled in 2008 at an intensity of 105 separate soil samples, each comprised of multiple soil cores. Our data are consistent with other studies in that root lesion nematodes occur in patches. Collecting too few cores or sampling too small an area of a field can miss a root lesion nematode problem. Due to the lack of distinctive above-ground symptoms, the best sampling scheme is to systematically collect cores in a pattern than covers the field.

Root lesion nematodes are able to feed on corn roots from the outside or they can crawl into roots to live and feed from the inside. Estimates of densities for root lesion must include roots to account for the proportion of the population living as endoparasites. Our data show overwhelming evidence that the best estimates are made using the root fragments collected with the soil sample. Digging a few plants for root assays can lead to a very biased and inaccurate estimate of the nematode population in the field and is no longer recommended.

Estimates of nematode population densities are the starting point for integrated nematode management. Not every field needs to be sampled every year, but every field should be sampled periodically to check the status of the nematode population. Ideally, the path traversed by the sample collector should be noted to insure that changes in assay results are real and not an artifact of the patchiness of nematode population densities. The introduction of new nematicides should help boost yields, but is not likely to decrease the damage potential of root lesion nematodes. Enhanced root growth contributes to better crop growth and yields, but it also means that the few nematodes remaining will have ample food to grow, reproduce, and build to high population densities for the next corn crop.