CONTROLLING PLANT-PARASITIC NEMATODES

Plant-parasitic nematodes are microscopic worms that feed on plants. They cause millions of dollars in yield losses each year and are becoming more problematic. Many nematode species are able to adapt to and overcome specific control strategies.

Scientists from 15+ land-grant universities are working together to enhance integrated nematode management. Researchers are advancing tools to identify nematodes, elucidating the interactions between plants and nematodes, and improving control strategies, including nematicides, resistant crop varieties, biocontrol agents, and farming practices. Controlling plant-parasitic nematodes in a safe, effective way is key to sustaining production of food, fuel, and fiber crops.

Benefits of the multistate approach:

- With few scientists working in the discipline, collaboration helps facilitate timely, productive research on nematodes.
- Working on a multistate team, researchers can learn from each other and address overlapping issues across the region.
- Diverse expertise allows the team to tackle a variety of crops and nematode species.

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Learn more: bit.ly/S1066

Photo by Travis Faske, University of Arkansas

RESEARCH HIGHLIGHTS

Monitoring Nematodes

Timely and accurate identification and quantification of nematodes enables appropriate control tactics to minimize yield losses and costs. For example, researchers discovered the apple root-knot nematode in North America for the first time, and researchers in New Mexico identified a new species of root-knot nematode.

Researchers developed new tools that can quickly and easily distinguish virulent nematode phenotypes.

Resistant Crops

Researchers assessed row crop varieties for resistance to multiple nematode species. Resistant varieties can be used immediately by farmers to mitigate yield losses. Scientists also identified proteins and genes that could be manipulated to increase plant defense responses and minimize nematode infection and disease progression. Newly identified sources of resistance will help prevent nematodes from overcoming a single source.

Other studies showed the impacts of the environment on crop resistance. For example, the gene for root-knot nematode resistance in Tifguard peanuts remains functional at soil temperatures of 34 °C.

Scientists discovered genetic weaknesses in nematodes that can be targeted by new crop varieties with specific resistance mechanisms. For example, recently identified proteins in lesion nematodes will help researchers develop the first crops with resistance to lesion nematodes. Other scientists are working on a soybean variety that can silence an essential gene in nematodes that feed on it, killing the nematodes and limiting reproduction.

Optimizing Nematicide Use

Data from nematicide field tests help farmers choose the best product for managing nematodes. Chemical companies also use data to determine if they are going to carry certain nematicides for producers in the mid-South region.

Researchers developed new “softer” chemistries for nematicides that have reduced risks.

Researchers developed new ways to deliver existing nematicides, including virus nanoparticles, cellulose wraps, and precision technology. These options make nematicide applications more targeted and efficient, maximizing nematode reduction and minimizing costs and side effects.

In corn, soybean, and cotton, applying plant hormones and starter fertilizers along with nematicides can improve yield.

Biological Nematicides

Scientists identified viruses that naturally “attack” soybean cyst nematodes and could be developed into new biological agents.

Studies discovered species of fungi that can be used to keep nematode populations in check.

Researchers are testing humic acid and soysoap for nematode control on farms and by homeowners, who have few safe options available to them for home garden use.

Crop Rotation

Rotating cotton with non-host crops like wheat can increase yields and restore profitability to nematode infested cotton fields.

Education and Outreach

Extension programs and materials provide farmers an unbiased view of nematode management options so that they can choose the best for their needs. For example, producers in Lonoke County who used study findings to select varieties with resistance to southern root-knot nematodes saw yields increase from 11 bushels per acre to 50 bushels per acre.

Nematode-resistant tobacco varieties are helping growers improve farm safety and environmental sustainability by reducing use of highly toxic materials like soil fumigants and carbamate insecticide. Replacing nematicide use with resistant tobacco varieties could save tobacco farmers in Virginia as much as $175 per acre.