Peanuts To Be Reckoned With

A peanut breeding project under way at Tifton, Georgia, could spell trouble for pesky root-knot nematodes.

Geneticist Corley Holbrook, Jr., and scientist colleagues have identified several dozen peanut germplasm strains resistant to this tiny roundworm that costs $20-40 million annually in yield losses and chemical controls.

Holbrook, along with Agricultural Research Service nematologist Bill Johnson and agronomist Mike Stephenson, is now cross-breeding the pest-resistant strains with higher yielding commercial cultivars. They hope to release the new material within 5 years. For farmers in Georgia and other southeastern states, it won't be a moment too soon. That's because the varieties they now grow generally can't survive severe nematode attack without protection from chemical nematicides.

The root-knot nematode, *Meloidogyne arenaria*, inflicts its costly mischief inside the plant's roots.

"The female penetrates the root and establishes a feeding site, which forms a gall that can disrupt the flow of nutrients," says Holbrook. He is in the ARS Nematodes, Weeds, and Crops Research Unit at Tifton. Severe infestations can cause yield losses of 70-plus percent.

Females also lay thousands of eggs on plants' roots, setting up farmers for a fresh round of losses the next season.

To break the cycle, scientists examined peanut germplasm collected from around the world for traits that inhibit nematode feeding or egg laying. They started with the National Peanut Germplasm Collection in Griffin, Georgia, a repository with 7,000 accessions, or seed samples from South American, African, and other countries.

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Healthy peanut plants with roots exposed.

From a core collection of 831 seed accessions, the scientists narrowed the search to 36 resistant strains. They did it by repeatedly exposing the plants to nematode attack in greenhouse studies. This enabled them to count the number of nematode galls and egg clusters deposited on plant roots.

Compared with Florunner and other commercial varieties, 21 of the resistant accessions had 70 percent fewer root galls and egg clusters. The two most resistant peanuts, both from China, showed a 90-percent reduction and are top picks for the breeding program.—By **Jan Suszkiw,** ARS.

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New Technique Could Boost Taxol Production

Usually, if something "grows on trees," it's considered plentiful. Oddly, taxol, a potent chemotherapeutic agent for treating breast, ovarian, and other cancers, does grow on trees. But it's scarce—and getting scarcer all the time.

That may change now, thanks to a new process, developed by Agricultural Research Service scientists and their collaborators, that promises to dramatically boost manufactured supplies of taxol.

ARS plant physiologist Donna M. Gibson, in Ithaca, New York, says paclitaxel, the generic term for taxol, originally came from the bark of the rare Pacific yew tree, *Taxus brevifolia* Nutt. "However, supplies of yew bark are scarce, and current extraction procedures are inadequate for providing enough of the chemical to meet increasing demand," says Gibson.

Synthetic methods of producing paclitaxel have been tried. But the chemical's molecular structure is so complex that commercial production is unfeasible.

"So production of adequate supplies of paclitaxel and precursors used in semi-synthetic processes may ultimately rely on biological processes like cell culture," Gibson says.

She was one of the first scientists to demonstrate that cell cultures from the yew tree can be used to produce the anticancer compound. Now, along with coinventors at Washington State University at Pullman and Cornell Research Foundation, Inc., at Ithaca, Gibson has filed for a new patent (09/126,229) on a process for enhancing production of paclitaxel.

"The technology screens yew cell lines to determine their potential for producing the chemical," she says. "Using it, producers will be better able to identify and select yew tree cell lines that are 5 to 10 times more productive than those currently being used."

The technique enables Gibson to screen multiple cell lines of all five known *Taxus* species for their ability to produce paclitaxel in vitro. She has also developed a method that uses an elicitor compound, methyl jasmonate, which, when added to the appropriate culture line, greatly increases the amounts of paclitaxel obtained from the selected cell lines.

Gibson's invention could significantly expand commercial production of taxanes to levels higher than any previously reported—welcome news for cancer patients whose doctors are prescribing this promising drug.— By **Hank Becker,** ARS.

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