Earthworm Casts Reflect Soil Conditions

The earthworms on the sidewalk after a summer storm are more than a fisherman's dream. *Lumbricus terrestris*—the common night crawler—is also a valuable tool for determining the health and viability of crop-producing soils. By studying the organic matter of earthworm fecal matter, or casts, scientists in the ARS Soil and Water Management Research Unit at the University of Minnesota have discovered a simple way to determine soil health in agricultural fields.

The casts contain soil, organic matter, microbes, and carbon, all of which give clues about the condition of the field. Researchers have found that reduced tillage farming and certain crops encourage carbon deposition, an indicator of high soil quality.

Earthworms ingest and mix fresh residues from crops like corn and soybeans with soil in a moist, microbe-rich environment. They also feed on microbes growing on residues. The carbon encapsulated by earthworms is a key building block in a well-structured soil.

"Earthworms are an important link in decomposing the previous year's crop residue," says Dennis Linden, an ARS soil scientist. "They are the primary consumer of organic material in the soil."

Scientists found that fields that had been tilled less had higher populations of earthworms. Another discovery: Corn residues produce a higher concentration of carbon deposits than soybean residues do.

"It appears earthworms need to consume more material from cornfields to get the same quantity of protein and nitrogen as they do from soybean residues," Linden says. "The earthworm doesn't need as much material when it eats soybeans."

Earthworms are being studied as one way to measure carbon sequestration, which is the capture and use of carbon in the soil.

Carbon is important because it improves soil's ability to support crop growth, water infiltration rate, and other functions. Linden says earthworms can greatly affect carbon sequestration.—By **Dawn Lyons Johnson**, ARS.

Dennis Linden is at the USDA-ARS Soil and Water Management Research Laboratory, University of Minnesota, 439 Borlaug Hall, St. Paul, MN 55108; phone (612)-625-6798, fax (612) 649-5175, e-mail dlinden@soils.umn.edu ◆

En Route to Virus-Free Melons

Four watermelon lines that have resistance to a key virus are now available to breeders. The lines are the result of a 5-year research project to find melons resistant to watermelon mosaic virus, an aphid-transmitted pathogen that can drastically reduce yields, says U.S. Department of Agriculture scientist A. Graves Gillaspie, Jr.

A plant pathologist with USDA's Agricultural Research Service in Griffin, Georgia, Gillaspie and ARS horticulturist Robert L. Jarret screened 670 germplasm accessions in the Griffin watermelon collection to find the resistant lines. All told, 1,530 watermelon accessions are housed at Griffin and another 300 at the National Seed Storage Laboratory in Fort Collins, Colorado.

How resistant to the virus are the new lines compared to commercial varieties now on the market? Gillaspie says that in a 1992 field test with the most resistant line, only 6 percent of the plants became infected after being intentionally exposed to the virus. That compares with 95 percent infection of the commercial variety Baby Bush watermelon.

Gillaspie says the resistant lines came from what are known as eguisi watermelons that originated in Africa, in what is now Nigeria. "About 25 percent of our collection are eguisi, and most of the virus resistance appears to be found in these melons," he says.

The four lines that have been released came from eguisi melons from Nigeria and Zaire. Gillaspie says he initially screened them in greenhouse and field studies against a Florida strain of the virus. Then, four of the most resistant lines were tested in the greenhouse against virus strains from Florida, Arizona, California, New York, Israel, and Italy. Gillaspie says he's received a lot of interest in the resistant melons from breeders in Florida, where the virus problem appears to be acute.

Gillaspie stresses that limited quantities of seed for the new lines are available only to public and private breeders, who must cross the lines with commercial types to develop new hybrids for public sale. He says it could take 5 years or more for breeders to incorporate the resistant lines into the sweet-tasting melons that are popular summer picnic fare.—By **Sean Adams,** ARS.

A. Graves Gillaspie, Jr., is in the USDA-ARS Plant Genetic Conservation Resources Unit, Regional Plant Introduction Station, 1109 Experiment St., Griffin, GA 30223; phone (770) 412-4777, fax (770) 229-3324, e-mail s9gg@ars-grin.gov ◆