

Corn's wild ancestors may have passed down beneficial bacterial species through seeds

What is this research about?

Endophytes are bacteria or fungi that live within a plant without causing disease. Although endophytes have been identified in all plant species studied to date, the relationship between endophytes and their host plant is not always clear. Scientists believe that when the first plant species arose 700 million years ago, they relied on bacteria and fungi to obtain nutrients and defend against harmful, disease-causing microorganisms. Modern endophytes may help the plants that host them in similar ways. Endophytes can be transferred from one generation to the next through the seeds, and the endophytes in the seeds may be different from those found in other parts of the plant. Corn, also known as maize, was domesticated from wild grasses called teosintes approximately 9,000 years ago in what is now southwestern Mexico. Corn seeds have changed dramatically as a result of agriculture – compared to teosintes, modern corn kernels are larger, softer, and less likely to fall off of the cob. While a great deal of research has been done on the endophytes found in corn, this research has not been focused on the seeds. Also, it is not well understood what effects human manipulation of corn (including breeding and migration to new areas) has on corn seed endophytes.

What did the researchers do?

Seeds were collected from four ancestral teosintes, seven Mexican corn “landraces” (breeds that have naturally adapted to their local environments), and three modern corn varieties from the U.S. Midwest or southern Quebec. Second generation seeds and plant stem samples were also collected from all fourteen corn/teosinte varieties and were grown in the same Ontario cornfield. Each bacterial species was identified and assessed to see which plant-beneficial functions it was capable of performing (e.g. releasing minerals; producing plant growth hormones). The researchers also measured the ability of each bacterial species to travel to other parts of the plant.

What you need to know:

Although seed bacterial communities were most similar among closely related corn and teosinte varieties, a core group of seed endophytes from the ancestral teosintes was preserved during the domestication process. Most seed endophytes helped plants obtain nutrients or encouraged growth, and some could travel outside the seed.

What did the researchers find?

Although the more closely related corn and teosinte varieties had the most similar endophyte communities, some seed endophytes were found in all varieties despite differences in genetics, geographic origin, and human uses. Some endophytes found in the seeds were distinct from those identified in other parts of the plant. The most common functions of seed endophytes were converting phosphate or nitrogen (essential minerals) to plant-usable forms, and releasing acetoin (a plant growth hormone). Some endophytes were able to move within the plant to the roots or enter the surrounding soil.

How can you use this research?

Corn breeders can use this research to understand how the local environment and purposeful breeding for human uses can affect the make-up of seed endophyte communities.

Plant scientists can further this research by studying how the various seed endophytes encourage plant growth or defend against harmful bacteria or fungi in the field. This may lead to the development of bio-based alternatives to chemical pesticides and fertilizers to assist both organic and conventional farmers.

About the University of Guelph researcher:

Manish Raizada is an Associate Professor in the Department of Plant Agriculture at the University of Guelph. Email: raizada@uoguelph.ca.

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