Nitrogen fertilizers finetune composition of individual members of the tomato microbiota

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After conducting a field trial at a tomato farm near Ravenna, Italy, a team of plant pathologists and agronomists found that nitrogen fertilizers shape the composition and predicted functions of the plant microbiota. The microbiota refers to the community of microorganisms found in the interface between the soil and the roots of a plant. Similarly to the human digestive tract, the microbiota can help or hinder the plant's nutrition as it is responsible for the uptake of minerals from the soil.

Nitrogen is one of the most important nutrients as is a key component for healthy crop production globally. Because the microbiota is crucial to the plant's ability to take in nitrogen, scientists are very interested in identifying ways to ensure this transfer.

Using state-of-the-art DNA sequencing technologies in the tomato fields, the research team involving the University of Dundee and the University of Modena and Reggio Emilia was able to make two striking observations about what happens to tomato microbiota when it is subjected to nitrogen fertilizers. First, they discovered the tomato microbiota is a gated community.

"Not all the microbes can proliferate in the same manner in the thin layer of soil surrounding plant roots, what scientists call the rhizosphere, and within root tissues," explained Davide Bulgarelli, a plant pathologist from the University of Dundee. "Interestingly, members of the bacterial phylum Actinobacteria appeared to be particularly keen on colonizing the interior of tomato roots."

Secondly, the application of different nitrogen fertilizer fine-tunes the composition of individual members of the microbiota. These microbes are likely to be key targets in optimizing the process of plant nutrition and enhancing global food security.

"It really seems that the diet, here represented by the different nitrogen treatments, is one of the key determinants of the plant microbiota," Bulgarelli concluded. "Knowing that plants have different microbial needs when subjected to different diets will help us identify the most effective inoculants for a given scenario."

Also of note, the lab-in-the-field approach used will likely expedite the translational applications of these findings for those focused on global food security.

For more information about this research, read "Nitrogen Fertilizers Shape the Composition and Predicted Functions of the Microbiota of Field-Grown Tomato Plants" published in the November issue of the open access *Phytobiomes* Journal.

More information: Federica Caradonia et al, Nitrogen Fertilizers Shape the Composition and Predicted Functions of the Microbiota of Field-Grown Tomato Plants, *Phytobiomes Journal* (2019). DOI: 10.1094/PBIOMES-06-19-0028-R

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