# Barley plants fine-tune their root microbial communities through sugary secretions

April 25 2024

The barley diversity panel growing at the John Innes Centre farm, Norfolk, UK. Credit: Alba Pacheco-Moreno (CC-BY 4.0, creativecommons.org/licenses/by/4.0/)

Different types of barley recruit distinct communities of soil microbes to grow around their roots by releasing a custom mix of sugars and other

compounds, according to a new study led by Jacob Malone of the John Innes Center, UK, published in the open-access journal *PLOS Biology*.

Beneficial soil microbes that live on or around plant roots can provide nutrition, help the plant withstand stress and protect it from pathogenic microbes. In return, the plant secretes a portion of the sugars it makes through photosynthesis, along with amino acids and other metabolites, into the surrounding environment. The composition of soil microbes that a plant attracts can vary widely, depending on what kinds of compounds the plant provides.

In the new study, researchers took a closer look at the relationship between a plant's genetics and its root microbes. They analyzed the microbiomes from two types of barley plants—a modern type named Tipple, and a traditional one, named Chevallier. The two barley types each had an overlapping core group of microbes associated with their roots, but with some distinct differences in the overall communities.

One common group of root microbes—the Pseudomonas genus—was especially abundant around Tipple roots. The researchers discovered that this is because Tipple plants secrete large amounts of sugars called hexoses (such as glucose or fructose), which Pseudomonas especially like to eat.

They also observed differences in gene activity between the two barley types that helped explain the variation in their root communities. When researchers tried to swap the microbial communities between the two plant types, each barley variety grew better when exposed to its original community.

The new findings suggest that plants can fine-tune the population of microbes colonizing their root zone, which can have important outcomes for plant health. While these findings came from plants grown in

greenhouses, researchers said that determining the extent to which these differences occur in barley growing in farm fields will be a key challenge for future research.

The authors add, "Our research shows that different barley varieties recruit distinct microbial communities from the soil, based on the sugars and other nutrients they secrete from their roots. These microbes help some varieties to grow but not others, suggesting that breeding cereals to recruit beneficial, growth-promoting microbes may be possible in the future."

**More information:** Pacheco-Moreno A, et al. The genotype of barley cultivars influences multiple aspects of their associated microbiota via differential root exudate secretion. *PLoS Biology* (2024). DOI: 10.1371/journal.pbio.3002232

Provided by Public Library of Science