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GENETIC CONTROL OF MAIZE ROOT FORMATION AND ITS INTERACTION WITH THE RHIZOSPHERE

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flavones, maize, Oxalobacteraceae, rhizosphere, root

The maize (*Zea mays* L.) root system is composed of functionally and structurally different root types formed at different stages of development. The rhizosphere is the small proportion of the soil and its microorganisms that is influenced by the secretion of the root. Beneficial interactions between the root system and the rhizosphere microorganisms are pivotal for plant fitness. The complex root system of maize is an excellent crop model to explore the relationship between root structure and function with the rhizosphere microbiota.

We demonstrated that transcriptomic gradients along the longitudinal root axis are associated with specific shifts in rhizosphere microbial diversity. Moreover, we established that root-derived flavones predominantly promote the enrichment of bacteria of the taxa Oxalobacteraceae in the rhizosphere, which in turn promote maize growth and nitrogen acquisition. Furthermore, we showed by genetic experiments that LATERALROOTLESS1-mediated lateral root development coordinates the interactions of the root system with flavone-dependent Oxalobacteraceae under low nitrogen conditions. In summary, our experiments revealed the genetic basis of the reciprocal interactions between root system architecture in maize and the composition and diversity of specific microbial taxa in the rhizosphere resulting in improved plant performance. These findings may open new avenues towards the breeding of high-yielding

and nutrient-efficient crops by exploiting their interaction with beneficial soil microorganisms.