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High-throughput phenotyping of 38 maize varieties for the study of rhizosphere traits affecting agronomic resilience under drought stress

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The occurrence of drought is likely to increase and intensify as a result of climate change, which poses a great challenge to agriculture. It is thus crucial to enhance agronomic resilience to secure food and feed production. Roots and root functioning as well as the interplay of roots with the surrounding soil, the rhizosphere, plays a key role in water acquisition of plants. Investigating rhizosphere traits is hence promising to shed light on future crops that better adapt to drought stress. A great strength of this study is the screening of various varieties which is facilitated by the high-throughput phenotyping method. It allows a wider coverage of traits and especially the genetic and phenetic diversities preserved in landraces.

Maize (*Zea mays* L.), being one of the major cereal crops worldwide, was selected as the plant of study. A total of 38 varieties, which encompasses hybrid varieties, open pollinated varieties, and landraces, were screened in the “Moving Fields”, a greenhouse equipped with the high-throughput phenotyping facility in the Bavarian State Research Center for Agriculture. Maize plants were grown in mesocosms filled with loamy soil. Plants were exposed to two water treatments, well-watered and drought-stressed, during vegetative stem extension stage. Dynamic plant development was captured by continuous image acquisition. A visible light (RGB) camera was used to document the size and architecture of shoots and roots, while a chlorophyll fluorescence

camera recorded the metabolic activity of shoots.

Using shoot images, we compared variety-specific plant growth curves under well-watered and drought-stressed conditions to highlight the growth strategy of plants towards drought stress. The results reveal differences in growth inhibition during drought across varieties. In addition, differences in shoot and root dry weights are found between landraces and modern varieties. More analyses are in progress in search of rhizosphere traits and their influences on agronomic resilience.