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CHARACTERIZATION OF ROOT MORPHOLOGY AND EVALUATION OF SORGOLEONE EXUDATION IN SORGHUM GENOTYPES CONTRASTING FOR PHOSPHORUS ACQUISITION EFFICIENCY

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Low phosphorus (P) availability in soil is one of the main constraints to crop development and production of sorghum plants. Plants have developed several strategies to increase P use efficiency, including modifications in root morphology, root hair elongation, root exudation and association with arbuscular mycorrhizal fungi (AMF). Sorgoleone is produced and released from the root hairs of sorghum and can alter microorganism communities from the rhizosphere. Through root exudate, plants can locally signalize for microorganism interaction and enhance nutrient availability in the surrounding environment. The aim of this study was to characterize sorghum genotypes that contrast for P acquisition efficiency under high and low P field conditions, regarding root morphology and sorgoleone exudation. First, we analyzed 30 sorghum genotypes grown in nutrient solution with low and high P, and observed phenotypic variability concerning root morphology, dry weight and P content traits. Under high P condition, the genotypes showed suppression in sorgoleone exudation analyzed by liquid chromatography coupled to mass spectrometry (LC-MS), while under low P the exudation was increased. A correlation analysis showed that total root length, total root surface area and surface area of fine roots have positive correlations among themselves and positive correlation with dry weight and P content. Moreover, it was observed a positive correlation between total dry weight and total P content. A principal component analysis grouped contrasting genotypes, based on sorgoleone exudation and root system traits. The observed variation regarding root morphology and sorgoleone exudation contributed to understand the plant response to low P availability, which is key to improve the sustainability of agricultural production.

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