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The Importance of Crown Root Angle and Mycorrhiza for Adaptation of Sorghum Genotypes from West Africa to Low-P Soils

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Abstract

Sorghum (*Sorghum bicolor* L. Moench) is a staple crop of the savannah zone of West- and Central Africa (WCA). Most of sub-Saharan African soils (75 %) are deficient in mineral nutrients for plant growth. Limited phosphorus (P) availability in soils is a serious and frequent constraint to sorghum cultivation in West Africa. Previous research has shown that breeding under low-P conditions is necessary and effective in identifying sorghum genotypes which are specifically adapted to low-P soils. However, there is limited knowledge on the specific adaptation mechanisms of these genotypes. The objective of the present study is to investigate the role of root-architecture and mycorrhiza-symbiosis in the adaptation of WCA sorghums to low-P soils.

In 2011 we conducted a pot experiment with 188 sorghum genotypes originating from WCA, which represent the Guinea, Durra and Caudatum races of Sahelian and Sudanian zone genotypes from different West African countries. The 188 genotypes were grown for 38 days on a low-P soil at ICRISAT-Mali. Plant height, vigor score, biomass, P-uptake and crown root angle were recorded for each pot. Furthermore fine root samples were taken from each pot to evaluate mycorrhizal colonization at the University of Hohenheim, which was still in progress by the time of writing this abstract. Preliminary results suggest significant genotypic differences for all measured traits, including crown root angle and intensity of mycorrhizal root colonization. Once measurements are completed, the relationships among the various traits within and across groups of germplasm will be assessed. Furthermore, genotypic performance in the pot trials will be tested for correlations with yield performance under field conditions, in order to elucidate the importance of the various traits for low-P tolerance. All 188 tested genotypes are currently also being genotyped as part of an association study. This will provide the opportunity to identify the gene loci and associated markers involved in low-P tolerance for use in marker-assisted sorghum improvement targeting low-P soils.

Keywords: Breeding, mycorrhiza, phosphorus, root angle, sorghum

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