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Effect of the arbuscular mycorrhizal fungus *Rhizophagus irregularis* on the phosphorus uptake of Sorghum and okra plants under water-deficient conditions

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Statement of the Problem: Mycorrhizal plants sometimes are able to tolerate drought stress better than non-mycorrhizal plants and therefore, maintain higher biomass production under dry soil conditions. *Sorghum* and okra are highly consumed crops in Sudan because of their association with the native food and they are mainly grown in the rain fed area.

Aim: This study will assess the potential of arbuscular mycorrhizal (AM) fungi to enhance drought tolerance in both crops, and their effects on plant P and N uptake under drought conditions.

Methodology: Sorghum (*Sorghum bicolor* L.) and okra (*Abelmoschus esculentus* L.) were grown in sterilized and fertilized loamy sand, with two phosphorus supply levels: 50 mg P (P1) or 100 mg P (P2) per kg dry soil. Plants were either inoculated with R. irregularis (+M) or left non-inoculated (-M). After four weeks of growth, plants were exposed to water stress, i.e. the soil was irrigated either to 15% (w/w) water content for the well-watered (+W), or 7% (w/w) for the water stress treatment (-W).

Findings: Inoculated *Sorghum* plants, irrespective of if grown under optimal phosphorus supply or phosphorus deficiency, showed a significant lower percentage of root length colonization (rlc) under water stress (-W) compared with well-watered plants (+W). In contrast under P stress (P1), plants were colonized on a high level in both water regimes. The rlc of Okra plants was between 80% and 93%, irrespective of the water supply.

Conclusion & Significance: As a result of the intended P supply, *Sorghum* and okra plants showed a higher total P uptake and biomass production in treatment P2 than in P1, irrespective of the presence of AM fungi or of the water stress. Sorghum plants in P2 treatment did not benefit from AM fungal colonization, while by trend higher total uptake of P was shown in (P1/+M) than in (P1/-M). Okra plants showed a higher dependency on AM fungal colonization, since (+M) plants took up more than double the phosphorus than (-M) plants.

Conclusion: Okra seems to have a clearly higher mycorrhizal dependency than *Sorghum*, not only under deficient but also under optimal phosphorus supply, the AM fungal contribution to okra plant P supply resulted into a much higher growth under water stress.

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