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Implications of root exudates on the formation of rhizosheaths

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Root exudates stimulate microbial activity and functions as a binding and adhesive agent that increases aggregate stability in the rhizosphere. The exudates produced from plant roots and microorganisms in the rhizosphere play a significant role in the formation of rhizosheath. Rhizosheaths comprises the soil that adheres to the roots with the help of root hair and mucilage even when it is removed from the surrounding soil. Low surface tension and great viscosity stabilize soil aggregates in surrounding root and develop rhizosheath formation. To our knowledge, no investigations are made on the influence of root exudates in soil rhizosheath formation, although it is well documented the formation and stabilization of rhizosheath of maize plants under various soil water contents but the influence of root exudates on the rhizosheath formation associated with other rheological properties is still missing. Such knowledge will greatly enhance the understanding of how rhizosheath is formed under different root and seed exudates and the effect of their physiochemical properties on the adhesion properties of mucilage will be studied in this project.

The aim of this study is to provide the first combined quantitative data on how root and seed exudates of different plants affect rhizosheath formation. We hypothesized that mucilage will contribute to the formation of rhizosheaths. For this, we will use the mucilage of chia seeds which acts as a modelled plant root mucilage and mix it with soil in five different concentrations. After preparing the soil with mucilage, artificial roots (flax cords) will be incorporated in this soil and after drying and wetting cycles roots will be removed and the mucilage adhesion, simulation and rheological properties will be investigated under various soil water contents, soil texture, soil type, and soil compaction.

Key words:

Rhizosheath, mucilage, drying and wetting cycles and soil structure