Master's Thesis Opportunity: Isotopic Approaches to Demonstrate the Importance of Biochar and Labile Substrate Interactions in Stabilizing Carbon

Project Overview:
Biochar, a refractory substance, has gained significant interest in agricultural research for its carbon sequestration capabilities and soil enhancement properties. Conversely, Mucilage, a labile substance composed of high molecular weight exopolysaccharides, plays a crucial role in the rhizosphere by forming biofilm-like structures that support microbial and enzyme activities, facilitating nutrient release even during drought conditions.

Despite the recognized benefits of biochar and mucilage individually, little information is available on their interactions in the soil. Understanding these interactions is vital for revealing the mechanisms that takes place in the rhizosphere, ultimately leading to improved management practices for biochar in agriculture and forestry.

Research Focus:
This project aims to identify the effects of biochar-mucilage interactions in soil. We conducted incubation experiments using soil mixed with 14C-labelled biochar and 13C-labelled mucilage. Key measurements include the release of $14CO_2$ from these labelled substrates, microbial biomass and its 13C/14C incorporation, and enzyme activities. We hypothesize that mucilage application will have minor effects on mucilage decomposition due to the biochar surface being predominantly coated by organic matter.

Thesis Topic:
Potential MSc thesis topics include:

Priming effects induced by combined biochar and mucilage addition in temperate luvisols.

Required skills: the candidates should have a strong background in biological or soil sciences and be willing to deal with isotopically labelled & radioactive samples.

If you are interested in exploring the mechanisms of biochar-mucilage interaction in soil carbon stabilization, please contact Dr. Callum Banfield (5U36) of the Geo-Biosphere Interactions Group at callum.banfield@uni-tuebingen.de.