

Which factors govern iron toxicity in a Thai rice paddy soil?

Master's/Bachelor's thesis with the Soil Chemistry Group

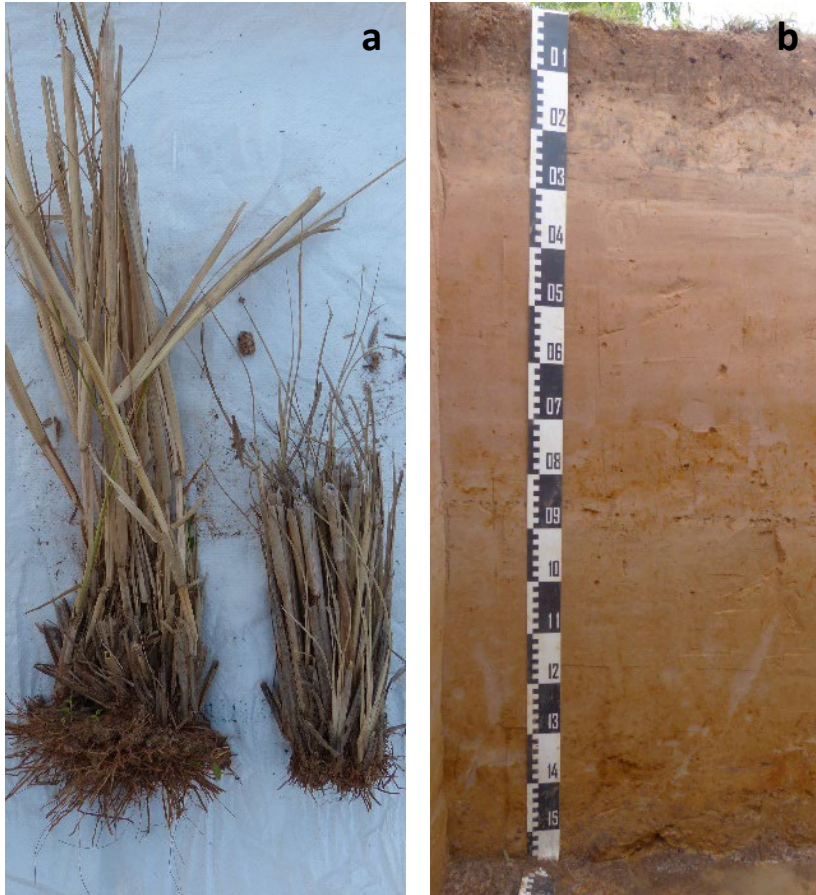


Figure 1: **(a)** Rice straw unaffected (left) and affected (right) by iron toxicity, **(b)** Soil profile at iron toxic site with bright orange redox features.

The Master's thesis project

- Field site:** Rice paddy field in Ubon Ratchathani, Thailand, where rice plants show symptoms of iron toxicity in specific parts of the field (Fig. 2).
- Samples:** In February 2020, we conducted a grid sampling of top- and sub-soil and sampled two soil profiles (toxic and non-toxic site) to 1,80 m depth for characterization (Fig. 1b).
- Objective:** **Find the causes and understand the key processes leading to heterogeneous iron toxicity in this rice paddy field.**
- Approach:** With our help, you will define your target questions, and plan and conduct appropriate laboratory experiments and analyses.
- Timing:** Start as soon as Autumn 2020

Background

Iron toxicity is one of the main yield limiting factors for lowland rice (Fageria et al, J. Plant Nutr., 2008). Rice production relies on extended periods of soil flooding, which may lead to the onset of anoxic conditions, and production of ferrous iron (Fe^{2+}). Toxicity is caused by high Fe^{2+} uptake of rice plants from the soil solution, which may lead to elevated production of radicals, and irreversible damage of plant cell components (Becker & Asch, J. Plant Nutr. Soil Sci. 2005). Affected rice plants show reduced growth, reduced yield and discolouring of leaves and roots (Fig. 1a). The extent of toxicity depends on various soil properties, such as pH, ionic strength and redox potential during flooded periods. (Fageria et al., J. Plant Nutr., 2008).

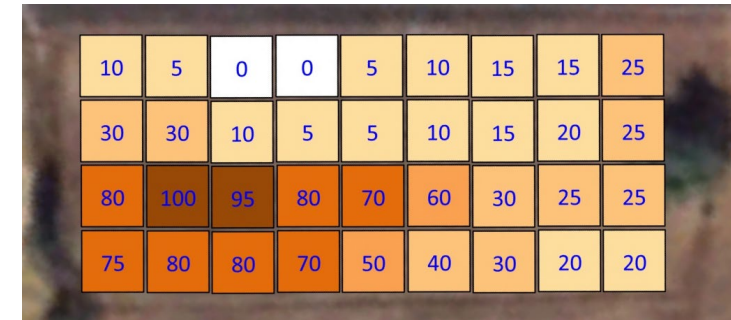


Figure 2: Estimated extent of iron toxicity in rice straw (%) of the field site in UB, Thailand, grid size = 6x6 m.

Are you interested in iron biogeochemistry in Thai soils? Contact us!

Prof. Dr. Ruben Kretzschmar ruben.kretzschmar@env.ethz.ch
Katrin Schulz katrin.schulz@usys.ethz.ch
Andrew Grigg andrew.grigg@usys.ethz.ch