



Tropentag, October 9-11, 2007, Witzenhausen

“Utilisation of diversity in land use systems:
Sustainable and organic approaches to meet human needs”

Field Validation of a Quick Screening Method for Iron Toxicity in Lowland Rice

SABINE STÜRZ¹, FOLKARD ASCH², MATHIAS BECKER³

¹University of Bonn, Inres/pflanzenernährung, Germany

²University of Hohenheim, Institute for Crop Production and Agroecology in the Tropics and Subtropics, Germany

³University of Bonn, Plant Nutrition in the Tropics and Subtropics, Germany

Abstract

Iron toxicity is one of the most important abiotic stresses in lowland rice constraining production in many rice production systems worldwide.

In flooded soils high concentrations of reduced iron lead to excessive Fe uptake by the roots and its subsequent transport into sensitive leaf tissues. The typical symptom of iron toxicity damage is a copper colouring of the leaves also called leaf bronzing. Particularly in early growth stages iron toxicity leads to severe yield reductions. One possible strategy to avoid yield losses due to iron toxicity is the use of resistant genotypes. Genotypes need to be targeted to the growing environment as the severity of iron toxicity not only depends on the resistance level of the genotype but is also strongly influenced by environmental conditions.

To date, selection tools for resistance to iron toxicity are based on leaf symptoms and yield reductions, which are not necessarily causally related.

Earlier work has shown, that includer / excluder strategies in rice can be identified and selected for, however, those methods have been tested only under controlled conditions so far. By those selection methods, tolerant genotypes (including Fe in the tissue without expressing bronzing symptoms), as well as resistant genotypes (excluding Fe as iron oxides on the root surface) have been identified.

In this study 15 local genotypes have been tested for mechanisms of iron toxicity resistance based on the screening techniques developed earlier in a hydroponic greenhouse experiment and a field trial. The aim was to compare the mechanistic results from the greenhouse screening to the results obtained in the field trial and thus validate the screening tool for transferability to field conditions.

Under both conditions leaf symptom scoring and visual assessment of the plant was conducted in the early vegetative stage followed by destructive sampling and analysis of Fe contents in leaves and stems. At the moment the sample analyses are ongoing. Results will be presented and the potentials and risks of a transfer of the screening method to field conditions will be discussed.

Keywords: Hydroponics, Iron toxic soils, oryza sativa, resistance mechanisms, Viet Nam