IRON TOXICITY IN WETLAND RICE (Oryza sativa L.) A PROBLEM OF LOW SOIL FERTILITY?

P. Deturck

Iron toxicity is a widespread nutritional disorder of wetland rice in the tropics. Phenotypic expression, occurence, yield loss and geographical distribution have been repeatedly described in the literature.

Early reports attributed this physiological problem to a variety of factors including low pH combined with high active iron %, H_2S toxicity, and Al toxicity.

Since, several authros have stressed on the importance of nutrient deficiencies such as K deficiency, Ca deficiency and Mn deficiency as the primary cause of iron toxicity. Recently a mechanism has been proposed where a multiple nutritional soil stress is considered an essential prerequisite for iron toxicity. Due to this multiple nutritional stress, more root exudates would be released in the rhizosphere, which would stimulate the microbial activity. This would cause a depletion of oxygen and an increase in iron reducing micro-organisms. Consequently, iron reduces would continuously solubilize the Fe-hydroxide root coatings, resulting in an incontrolled influx of Fe^{++}.

In our study, a large number of soil samples have been analysed in order to examine the presence of the multiple nutritional soil stress in iron toxic rice soils. Besides, the occurence of an increased microbial activity as a consequence of higher root exudation of K- deficient iron toxic plants was investigated.

Results indicate that iron toxicity is caused by a multitude of factors of which the most pronounced is a strong deficiency of K. K fertilization results in a reduced Fe uptake by the plant, a declined total microbial activity and a decreased number of iron reducing micro-organisms in the rhizosphere of iron toxic soils.

However, the interaction of low, CEC, acid pH, Mg and Mn deficiency and high active Fe levels could certainly aggravate this disorder.

The function of P, Ca and Zn in the iron intoxification mechanism could not clearly be established and urges further investigation.