# Root Associated Bacteria Suppress Symptoms of Iron Toxicity in Lowland Rice

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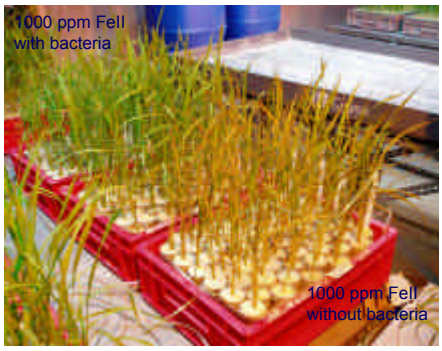
## Introduction

The beneficial effects of root-associated bacteria in biologically controlling soil borne pathogens have been well established. Conversely, little is known about how these beneficial micro organisms affect responses of plants to abiotic stresses. An investigation was thus undertaken to evaluate whether root-associated bacteria endemic to rice could be used to mitigate the effects of iron toxicity symptoms in lowland rice. To date no bacteria strain is known to positively affect plant responses to iron toxicity. Bacteria strains used in this study were isolated from seminal roots of Bangladesh and Taiwanese *Oryza sativa indica* lowland rice genotypes

## Conclusions

- Inoculation with bacteria strains from rice roots helped mitigating Fe-toxicity symptoms in lowland rice.
- *B. megaterium* reduced Fe concentration in leaves.
- Causes and mechanisms of this beneficial role need to be studied.
- Possible application through e.g. seed priming will be investigated.

## Results - Summary

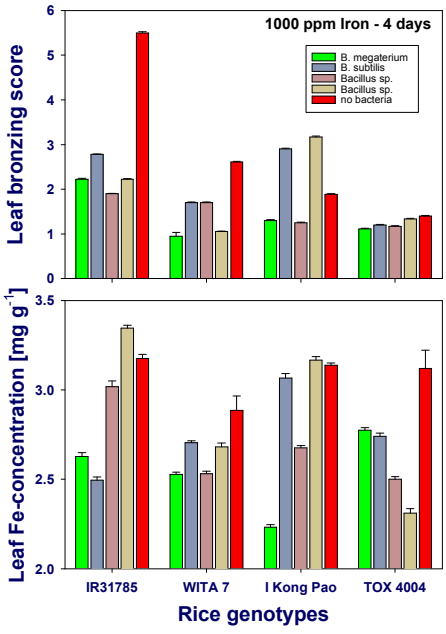



Three of the inoculates significantly reduced iron toxicity symptoms, one (*Bacillus sp.*) aggravated the symptoms.

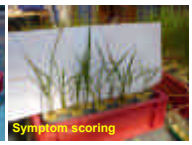
Typical symptoms of iron toxicity are brown spots and brown-orange colouring of leaves known as bronzing.


Some inoculates oxidized FeII to FeIII on the root surface, resulting in deep orange coloring of the root system – a possible mechanisms to reduce FeII uptake

Inoculation with *B. megaterium* reduced leaf symptoms and leaf Fe concentration in all genotypes.




## Notes on Materials and Methods



- We isolated several strains of Bacillus from surface sterilized seeds of lowland rice and maintained them at -18 °C.
- Four lowland rice genotypes contrasting in Fe toxicity tolerance were included.
- Plantlets were grown in a hydroponics system with Yoshida solution for 2 weeks, 1000 ppm Fe was added for 7 days after one week of bacteria inoculation.
- Four bacteria, *B. megaterium*, *B. subtilis*, and two isolates of Bacillus sp. were used to inoculate root systems of 3-week-old seedlings.
- Five days after initiation of the treatments genotypes were visually scored for bronzing symptoms and destructively sampled for tissue iron analyses.
- Finely ground samples were analysed for Fe content using high pressure acid digestion and AAS.