

## Reference 4 Iron toxicity

### Summary

This reference addresses iron toxicity, a serious problem affecting rice growth in inland-valley lowlands, especially in the moist savanna zone. It is a nutrient disorder associated with high iron concentrations in the soil solution. All types of inland valleys, with or without water control, may be affected by iron toxicity. This reference focuses on recognition and causes of iron toxicity and ways to control it.

### Observations

#### *The rice plant*

The first symptoms of iron toxicity are small reddish to brownish spots on the older leaves of the rice plant. These spots begin to appear at the leaf tips and spread onto the whole leaf, which becomes bronze–brown and dries out (*see* Photo pages: Photo 4.1). Iron toxicity also results in reduced rice growth (height, tillering) and in increased spikelet sterility. Productivity can drop by between 10 and 100% depending on the iron concentration in the solution and the tolerance of the cultivar. The effects of iron toxicity are more visible during the dry season than during the rainy season.

#### *The soil*

Substances that look like oil spills in the flood water and reddish stains in the soil (*see* Photo pages: Photo 4.2) indicate high concentrations of iron in the soil. Under prolonged flooded conditions, without drainage, this can lead to iron-toxicity symptoms in rice.

#### *Causes of iron toxicity*

Most inland valleys in West Africa lack adequate drainage facilities. Stagnant water (resulting from poor water management) creates conditions favorable to iron toxicity. High iron concentrations in the inland-valley bottom are often related to high iron concentrations in the soil itself. Levels may be further increased by iron coming down the slopes, either by surface or sub-surface flow. In the waterlogged soils of the inland-valley bottom, visible red oxidized iron (*see* Photo pages: Photo 4.3) is transformed into an invisible soluble reduced iron, which is toxic to rice.

### Iron toxicity control

Several iron-toxicity control options can be proposed. At the watershed level, iron accumulation in the inland-valley lowlands can be reduced by blocking or interrupting the sub-surface flows (through construction of roads, canalization). At the water-management level, improved water circulation helps evacuate excess iron in the irrigation water and brings oxygen into the soil solution. The best way to

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control iron toxicity at the plot level is to use tolerant rice varieties, such as CK4, Suakoko 8, WITA 1 and WITA 3. In general, fertilizer application decreases the iron absorption of the plant and will help to rectify the nutrient disorder. Adding a small amount of zinc (5–10 kg/ha) can, to a certain extent, be an additional option to mitigate iron-toxicity problems.

### Bibliography

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