

RESEARCH ON IRON TOXICITY IN WETLAND RICE

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The major aim of our study is to significantly increase the yield of rice on soils which are currently only marginally productive. In the initial phase of the programme the environment in which the plant grows was characterized in detail and adapted technologies were designed to eliminate some of the major growth limiting factors.

Although it is technically quite possible to obtain, even on a problem rice soil, a satisfactory yield of around 5 T/ha using an optimal amount of inorganic and organic fertilizers, the correct variety, and an improved water control system, technically feasible solutions often proved to be uneconomic and thus unpracticable for the farmer.

Contrary to the standard approach to soil science, where the environment is adapted to suit the plant, our attention last year concentrated on mechanisms by which the rice plant itself can actively control its immediate environment. Rice is known to be the plant which grows under the widest possible range of agro-ecological zones. Trying to understand the fundamental physiological defense mechanisms of a plant against an environmental stress is the first step in "design" a model plant which is **both high yielding and tolerant** to a variety of environmental stresses.

Therefore, work was initiated to correct and purify plant metabolites which are actively extruded in the soil atmosphere. It is believed that these exudates play a significant role in the uptake of essential nutrients as well as toxic substances by the plant. The totally different iron-uptake patterns at varying concentration of iron in the soil clearly illustrate that the plant can indeed actively control the total uptake and thus final iron concentration in the plant. Uptake mechanisms for other elements will be investigated in the future.

Unfortunately, the major difficulties in the study of the interaction zone between soil and plant are still of a practical nature despite enormous technological progress. Genetic manipulation of physiological defense mechanisms of a rice plant will remain a challenging task for the next decade.