

## Study paves way to improve rice productivity

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New Delhi, Sep 22 (India Science Wire): Rice is a mainstay for global food security. About two-thirds of the world's population is dependent on it as a staple food crop. With the constantly increasing global population, there is a need to increase rice productivity. Scientists across the world have been looking at ways to address this issue. Soil nutrient deficiency is one of the primary limiting factors in rice production. Consequently, one of the strategies has been to help overcome this.

A new study by a team of scientists at the Department of Biotechnology's New Delhi-based National Institute of Plant Genome Research (DBT-NIPGR) could help develop rice varieties that have greater tolerance to Potassium deficiency in the soil. Potassium is one of the most important macronutrients for plants. Plants require, among other things, a high and relatively stable concentration of Potassium ion to activate many enzymes that are involved in respiration and photosynthesis. Potassium is also involved in key cellular processes such as energy production, and cell expansion.

However, despite being among the most abundant minerals in the soil, its availability to plants is limited. This is because most of the soil Potassium (about 98%) is in bound forms and its release into the soil solution is far slower than the rate of its acquisition by the roots. The availability of Potassium in the soil solution or exchangeable form depends on multiple factors like soil acidity, presence of other monovalent cations like Sodium and Ammonium ions and the type of soil particles. Deficiency in Potassium affects plants by inhibiting the growth of the roots and the shoots. Studies have shown that plants that are deficient in Potassium are more susceptible to salt, drought, chilling and other abiotic and biotic stresses.

In their new study, the scientists' team at DBT-NIPGR found that overexpression of a gene called *OsJAZ9* helped make rice plants more tolerant of Potassium deficiency. A plant hormone called Jasmonate (JA) is often associated with the plant's defense against biotic factors like insects, pests and other pathogens.

The new study revealed that there was an enhanced accumulation of JA-Ile - - a bioactive form of the hormone, in rice on potassium deficiency. The JA-Ile then activates potassium transporters for its uptake from the media. The green revolution of the 1960s was driven by another plant hormone called Gibberellins (GA): manipulation of GA produced semi-dwarf varieties. The new study suggests that future research could be targeted towards JA which can help achieve both nutrient efficient crop and protection against pests.

The study was conducted by Jitender Giri, Ajit Pal Singh, Bipin K. Pandey, Poonam Mehra and Thierry

Heitz. They have published a paper on their work in the Journal of [Plant Molecular Biology](#) of Springer.

The senior author of the paper, Dr. Jitender Giri said “future agriculture has to be input efficient rather than input intensive. This study adds to the molecular/genetic resources for improving fertilizer use efficiency in rice which is of prime value for achieving sustainable agriculture”.

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keywords: macronutrients, enzymes, respiration photosynthesis, cellular process, cell expansion, gene, hormone, soil acidity, sodium, ammonium ions, roots, shoots, salt, drought, chilling, abiotic stress, biotic stresses



*Dr. Jitender Giri and his colleagues at their lab in NIPGR*