Gene-Edited Japonica Rice

Source: TH

Indian scientists have successfully used **CRISPR-Cas9 technology** to increase **phosphate** uptake in **japonica rice varieties**, potentially revolutionizing yield and reducing fertilizer use.

- **Phosphate Efficiency: CRISPR-Cas9 gene editing** in **japonica rice varieties** boosted **yield by 40%** using only **10% of the recommended phosphate fertilizer dose.**
  - **CRISPR-Cas9** is a revolutionary tool that enables scientists to **precisely modify the genome** by using the **Cas9 enzyme** as **molecular scissors** to accurately **cut DNA** and **insert, delete, or repair genetic material.**
- **Mechanism:** The key gene edited was **OsPHO1;2**, responsible for **phosphate transfer from root to shoot**, by **removing the repressor's binding site** rather than the repressor itself.
- **Significance:** India imports over **4.5 million tonnes of phosphate fertilizers**, making this gene-editing approach **vital for agricultural sustainability and self-reliance.**

Nutrient Deficiency in Indian Soils

- According to a 2022 study by the **Centre for Science and Environment (CSE)**, approximately **85% of soil samples are deficient** in organic carbon.
- Indian soils are **97% deficient in nitrogen** (crucial for crop growth), **83% in phosphorus** (vital for root and seed development), and **71% in potassium** (regulates water and nutrient flow in plants).
- Indian soils show deficiencies in **Boron (47%)**, **Zinc (39%)**, **Iron (37%)**, and **Sulphur (36%)**, impacting **nutrition security**, as **zinc-deficient grains** can worsen **malnutrition.**

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