Jasmonate Hormone and Rice Productivity

Why in News

A new study by a team of scientists at **National Institute of Plant Genome Research (NIPGR),** New Delhi suggested that targeting a specific plant hormone **Jasmonate (JA)** would help rice plants have greater tolerance to potassium (K) deficiency and improve productivity.

Key Points

Findings:

- The **overexpression** of a **gene** called **OsJAZ9** helped make rice plants more tolerant of potassium deficiency.
- There was an enhanced accumulation of **JA-Ile —** a **bioactive** form of the hormone **Jasmonate (JA),** in OsJAZ9 overexpressing rice, on potassium deficiency.
- The **JA-lle** helps in modulating various K transporters

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and root system architecture.

- **JA-Ile** contributes to several aspects of plant growth and development and levels increase under stress conditions.

- The study suggests that targeting research towards **JA** could help achieve both, nutrient- efficient crops and protection against pests

- JA is often associated with the plant's **defence against biotic factors** like insects, pests and other pathogens.

Potassium.

Potassium (K) is considered a **macronutrient** for plants and is the most abundant cation within plant cells.

Significance of potassium:

- Plants require, among other things, a **high and stable concentration** of potassium ion **to activate many enzymes** that are involved in **respiration and photosynthesis.**

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- Potassium is also involved in key cellular processes such as **energy production,** and **cell expansion.**

- **Cell expansion** is the process of taking cells extracted from tissue, culturing them in the lab and encouraging them to reproduce.

- **Potassium Deficiency:** It 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. Potassium deficiency occurs frequently in plants grown on sandy soils resulting in a number of symptoms including curling of leaf tips and yellowing (chlorosis) of leaves, as well as **reduced growth and fertility.**

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- ✓ **Potassium Availability to plant Roots:** 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.

- ✓ 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.**

Macro and Micro-nutrients

- **Macronutrients** are divided into two groups: **primary** and **secondary**
- The **primary macronutrients** are those that are needed in the highest concentration: **nitrogen (N), phosphorus (P), and potassium (K).** In fact,

these three primary nutrients are needed in higher concentrations than the rest of the macronutrients combined.

- **Secondary** macronutrients are also required for sustained plant health, but in lower quantities than the primary macronutrients. **Calcium (Ca), Magnesium (Mg), and Sulfur (S)** comprise the secondary macronutrients.

Micronutrients are also essential to plant development and growth but are needed only in trace amounts, compared to their macro-counterparts. The seven critical micronutrients are:

- Boron (B)
- Zinc (Zn)
- Iron (Fe)
- Manganese (Mn)
- Copper (Cu)
- Molybdenum(M)
- Chlorine (Cl)

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Way Forward

- The **Green Revolution** of the 1960s was driven by another plant hormone called

- **Gibberellins (GA).** JA hormone can be the new focus.

- **Future agriculture** has to be **input efficient** rather than input intensive. The genetic resources for improving fertilizer use efficiency in rice which is of prime value for achieving sustainable agriculture must be stressed upon

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