

India gets first herbicide-tolerant & non-GM rice varieties

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In news- The Indian Agricultural Research Institute (IARI) has developed the country's first-ever non-GM (genetically modified) herbicide-tolerant rice varieties.

About the new rice varieties-

- The varieties – **Pusa Basmati 1979 and Pusa Basmati 1985**, contain a mutated **acetolactate synthase (ALS) gene**.
- Water is a natural herbicide that takes care of weeds in the paddy crop's early-growth period.
- The new varieties simply replace water with Imazethapyr, a broad-spectrum **herbicide, to control weeds**.
- Hence there's no need for nursery, puddling, transplanting and flooding of fields.
- They can be **directly seeded and significantly save water input and labour compared to conventional transplanting**.
- Imazethapyr, effective against a range of broadleaf, grassy and sedge weeds, can't be used on normal paddy, as the chemical does not distinguish between the crop and the invasive plants.
- The ALS gene in rice codes for an enzyme (protein) that synthesises amino acids for crop growth and development.
- The herbicide sprayed on normal rice plants binds itself to the ALS enzymes, inhibiting their production of amino acids.
- The new basmati varieties contain an **ALS gene whose DNA sequence has been altered using ethyl methanesulfonate, a chemical mutant**.

- As a result, the ALS enzymes no longer have binding sites for Imazethapyr and amino acid synthesis isn't inhibited.
- The plants can also now "tolerate" application of the herbicide, and hence it kills only the weeds.
- This is **herbicide-tolerance through mutation breeding, not by Genetic modification (GM)** to ensure no foreign gene in the new varieties.

ICAR-IARI

- The Indian Agricultural Research Institute (IARI), commonly known as the Pusa Institute is India's national Institute for agricultural research, education and extension.
- The name Pusa Institute is derived from the fact that the institute was originally located in Pusa Bihar as the Imperial Institute of Agricultural Research in 1911.
- It was then renamed as the Imperial Agricultural Research Institute in 1919 and following a major earthquake in Pusa, it was relocated to Delhi in 1936.
- The current institute in Delhi is financed and administered by the Indian Council of Agricultural Research (ICAR).
- The IARI was responsible for the research leading to the "Green Revolution in India" of the 1970s.