

Pangenome

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Pangenome Latest News

Scientists have created the first-ever pangenome of Asian rice (*Oryza sativa* L.) by compiling genetic data from 144 varieties of both wild and cultivated rice strains.

About Pangenome

- A **pangenome** includes not only the **core genes shared by all varieties** but also the **unique genes found in individual strains**, offering a **comprehensive map of genetic diversity** in Asian rice.
- This project is **comparable to the Human Genome Project (2003)** in its goal to map genome-wide variations, but it is focused on **rice**, which is a **staple food for nearly two-thirds of the world population**.
- **India**, a major rice producer, recorded a **record production of 220 million tonnes** in 2024-25 over **51,000 hectares**, with an **average yield of 4.2 tonnes/hectare**.
- The new **pangenome database enables the development of advanced rice cultivars** with **enhanced traits**, such as **disease tolerance** and **resilience to climate shocks**.

Key Findings

- **Researchers used high-fidelity sequencing (PacBio HiFi)** and advanced computational tools to assemble **3.87 billion base pairs of novel genetic sequences**, which were **absent from the earlier reference genome** of *Oryza sativa ssp. japonica*.
- A total of **69,531 genes were identified**, out of which:
 - **28,907 are core genes** common to all varieties,
 - **13,728 are specific to wild rice**, and
 - **About 20% of all genes were unique to wild rice species**, offering potential for future improvements in rice breeding.
- **Indian Council of Agricultural Research (ICAR)** recently developed **two genome-edited rice varieties - Samba Mahsuri and MTU 1010** – that show promise for **higher yield and drought resistance**, though they are **not yet released for cultivation**.

Threats

- **Climate change is a significant threat** to rice production in India. The country has seen an **average temperature rise of 0.7°C since 1901**, and **2024 was the hottest year recorded**, with **minimum temperatures 0.9°C above average**.
- Rising temperatures also **increase arsenic uptake** in rice, posing risks to both **health and crop yield stability**.

Pangenome FAQs

Q1: What is the Pangenome of Asian Rice?

Ans: The Pangenome of Asian Rice is a comprehensive genomic database that includes all the genes present across multiple rice varieties, both wild and domesticated, rather than relying on a single reference genome like earlier studies.

Q2: Why is the Pangenome important for rice research?

Ans: The Pangenome helps capture genetic diversity across rice strains, enabling researchers to identify genes responsible for drought resistance, disease tolerance, yield improvement, and nutritional quality, which are critical for breeding climate-resilient rice.

Source: TH

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