A New Gateway in Plant Systemic Alarm Signalling

Prelims: *Current events of national and international importance | Environment*

Why in News?

Recently, researchers identifying CNGC13, a previously uncharacterized protein serving as a vital cyclic nucleotide-gated calcium ion (Ca^2+) channel.

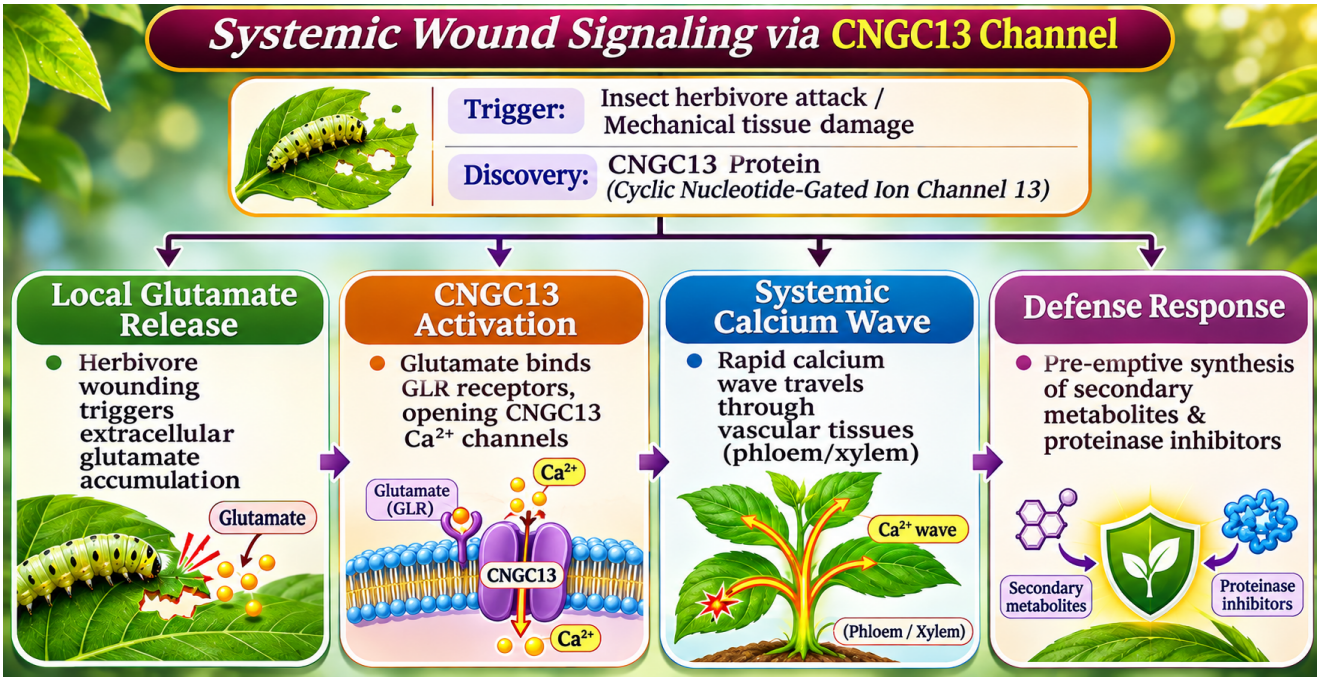
- CNGC 13 acts as a primary entry gateway in plants' systemic alarm system.
- It enables damaged leaves under insect herbivore attack to rapidly transmit long-distance defense signals to undamaged distant leaves.

Key Highlights

Parameter	Scientific Details
Research Institution	• **National Institute of Plant Genome Research (NIPGR)**, New Delhi.
Identified Protein/Channel	• **CNGC13** (*Cyclic Nucleotide-Gated Channel 13*) — a specialized calcium ion-permeable channel located in plasma membranes.
Signal Transduction Cascade	• **Initial Wounding -** When a chewing insect attacks a leaf, damaged cells release extracellular glutamate. • **Channel Opening-** Glutamate binding triggers membrane depolarization and opens **CNGC13** channels. • **(Ca^2+) Influx Wave -** Influx of extracellular **(Ca^2+)** through CNGC13 generates a systemic, propagating calcium wave traveling along plant vascular tracks at speeds of millimeters per second. • **Distal Activation-** Undamaged leaves receive the calcium wave, triggering the synthesis of defense phytohormones (such as Jasmonic Acid) and anti-herbivore toxins before pests arrive.

Strategic Significance

- **Mitigating Global Crop Losses-** Insect pests account for roughly **20% of global annual crop losses** (expected to escalate due to climate warming).
- Deciphering plant-native early warning systems provides targets for developing self-defending crop varieties without heavy synthetic chemical insecticides.
- **Biotechnology & Molecular Breeding -** Knock-out studies demonstrate that plants lacking functional CNGC13 fail to launch systemic defenses.
- Modulating or over-expressing CNGC13 via **gene editing (CRISPR)** or marker-assisted selection can yield insect-resistant cultivars in major staples like rice, wheat, and mustard.



Reference

[The Hindu | New gateway in plants' alarm system]

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