**DBT/NIPGR**

## Understanding how plants defend against insects and microbes

By Sunderarajan Padmanabhan

New Delhi, April 08: Plants do not have a nervous system. Yet, they are able to rapidly defend against chewing insects and invading microbes. They do so by changing the cellular levels of calcium ions ($Ca^{2+}$) to activate defense signalling upon various biotic stress.

In this BioCARe project, it was hypothesized that since fast moving $Ca^{2+}$ elevations in local and systemic leaves are crucial in plant-defense against herbivory, there should be specific $Ca^{2+}$ channels that generate these $Ca^{2+}$ fluxes which could be used as targets of crop improvement.

The question was addressed in model plant *Arabidopsis thaliana* and Tomato, both of which are targets of the chewing insect *Spodopteralitura*. $Ca^{2+}$ elevations upon stress perception occur due to opening of ion channels on plasma membrane or intracellular compartments allowing $Ca^{2+}$ influx into cytosol. A combination of reverse genetics, cellular imaging and transgenic approach was used to address the question.

It was found that cellular calcium elevation is an important signal used by plants for recognition and signaling of environmental stress. Perception of the generalist insect, *Spodoptera litura*, by *Arabidopsis thaliana* activates cytosolic Ca2+ elevation, which triggers downstream defense. However, not all the Ca2+ channels generating the signal have been identified, nor are their modes of action known. This work has reported a rapidly activated, leaf vasculature- and plasma membrane-localized, CYCLIC NUCLEOTIDE GATED CHANNEL19 (CNGC19), which activates herbivory-induced Ca2+ flux and plant defense. Loss of *CNGC19* function results in decreased herbivory defense. The work reveals a key mechanistic role for the Ca2+ channel CNGC19 in the recognition of herbivory and the activation of defense signaling.

**Contact Person & details:**
Dr. Jyothilakshmi Vadassery
Staff Scientist (III), National Institute of Plant Genome Research (NIPGR),
Aruna Asaf Ali Marg, New Delhi 110067
Email: jyothi.v@nipgr.ac.in, jyothi.nipgr@gmail.com,