Signaling molecule may regulate proteins in wheat plants

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Dr Sunita Ramesh is a plant researcher at Flinders University. Credit: Flinders University

Triggers for food crop growth are complex and new research by South Australian plant scientists is investigating one way wheat responds to common stresses such as poor soil health.

Research led by Flinders University is aiming to understand how a

signaling molecule, known as gamma aminobutyric acid (GABA), may regulate proteins in wheat plants dealing with a range of extremes.

"This emerging research suggests that GABA is a signal in plants, not only regulating numerous normal developmental processes such as root growth, stomatal aperture and pollen tube germination but also responses to stresses such as aluminum toxicity and salinity," says Dr. Sunita Ramesh, lead author of the research published in the journal *Biology*.

"We understand this signaling molecule in animals but not as much in plants," she says.

"Earlier research showed that in response to stress, GABA regulates the activity of ion transport proteins and under certain conditions these proteins may also transport GABA in plants. To understand the role of GABA in stress tolerance, it is essential to distinguish between the two transport modes of these proteins."

Using the aluminum-tolerant wheat variety (Triticum aestivum), researchers from Flinders University, the University of Adelaide and Waite Research Institute experimented with a plant derived pharmacological agent, picrotoxin, to distinguish between the transport capabilities of proteins involved in conferring aluminum tolerance.

Outcomes of this study indicate that picrotoxin blocks transport of negatively charged ions through the protein but allows transport of GABA and that the transport is dependent on the conformation of the protein.

The experiment is a stepping stone in understanding the role of other agents to reduce or enhance GABA activity in plant crops, says co-author Abolfazl Dashtbani-Roozbehani, also from the College of Science and Engineering at Flinders University.

Researchers hope new investigations into understanding the role of GABA could help identify wheat cultivars and other crops that are more resilient to common farm production problems such as extreme temperatures, salinity, aluminum toxicity in acid soils and even drought.

More information: Sunita A. Ramesh et al, Picrotoxin Delineates Different Transport Configurations for Malate and γ Aminobutyric Acid through TaALMT1, *Biology* (2022). DOI: 10.3390/biology11081162

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