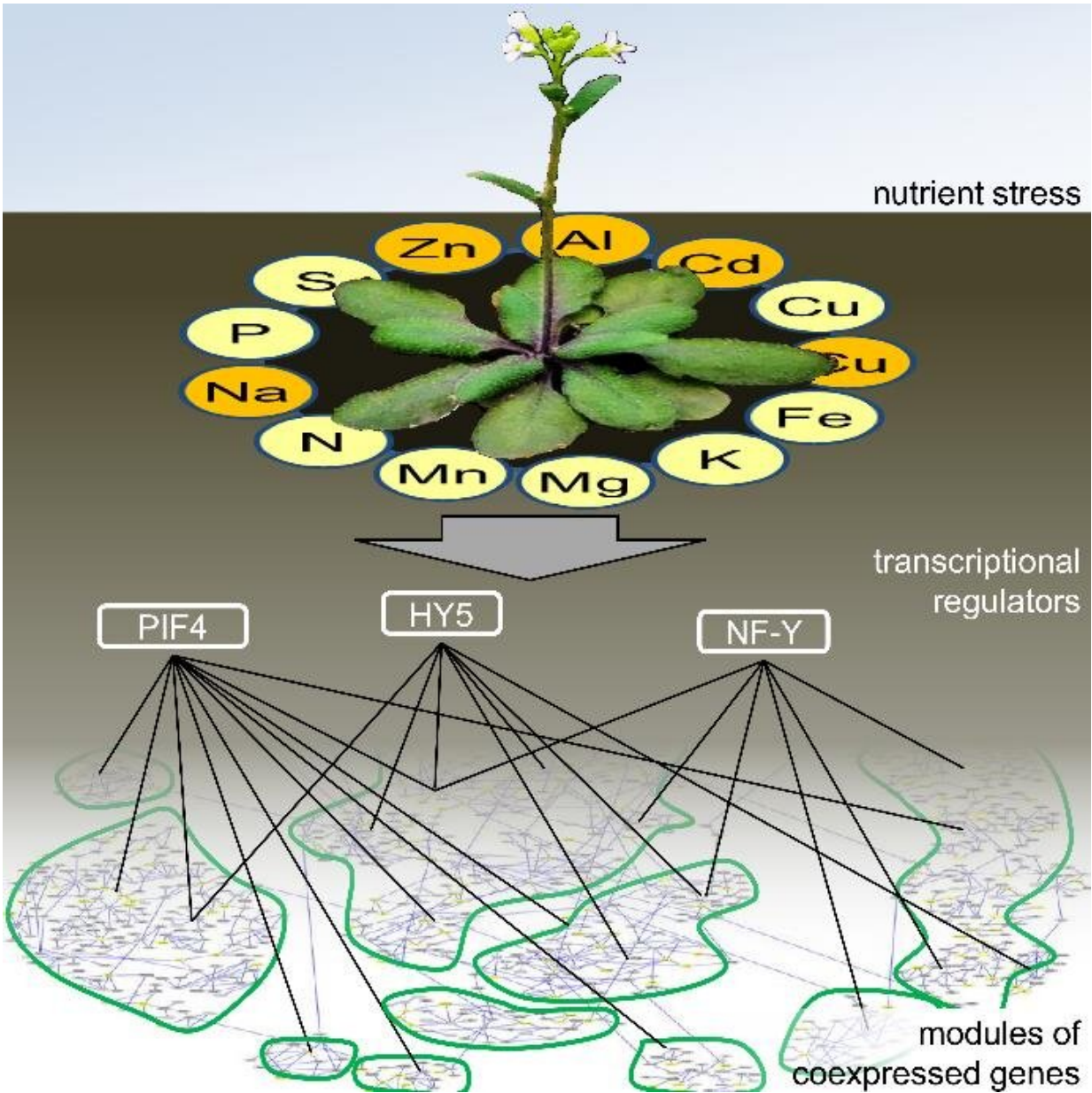


Stressed plants must have iron under control

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Plants have to absorb a large number of nutrients, but often these are available in

varying amounts due to changing environmental conditions. They respond by activating different genetic programs in phases of nutrient scarcity. Researchers at HHU found that iron in particular is handled differently. Credit: HHU / Rumen Ivanov

When land plants' nutrient availability dwindles, they have to respond to this stress. Plant researchers at Heinrich Heine University Düsseldorf (HHU) have used available data to examine which genes plants activate in the event of stress and what they mean. They published their findings in the journal *iScience*.

Unlike animals, [plants](#) cannot move and tap into new resources when there is a scarcity or lack of nutrients. Instead, they have to adapt to the given situation. They do so by activating sets of [stress](#)-specific genes. As a result, they basically reprogram their metabolism.

Plant researchers Dr. Tzvetina Brumbarova and PD Dr. Rumen Ivanov from the HHU Institute of Botany looked at the stress programs activated by the model plant *Arabidopsis thaliana*. They wanted to find out which response strategies are used by the plant, which is also known as thale cress. Brumbarova and Ivanov used a computer-assisted approach to analyze extensive gene expression data from the scientific community.

Based on the analysis, the HHU researchers found that the data contained some surprising strategies used by *Arabidopsis*. First, three of the main regulators identified by the authors to play a role in stress responses are already known: They also control the plant's response to light. "This suggests that light can also control [nutrient uptake](#) in the subterranean parts of the plant like the roots," explains Tzvetina Brumbarova.

Even more important is the discovery that plants adapt their [iron levels](#) in particular when there is a lack of nutrient availability. Rumen Ivanov says, "In stress situations like these, [iron](#) can quickly turn from friend to foe. On the one hand, iron is vital for various processes in order for the plant to survive. On the other hand, however, iron can also result in reactive compounds that can cause irreversible damage to the plant when there is a scarcity of nutrients."

Yet another discovery took the researchers by surprise. "In the case of stress, the plant mainly tries to adapt iron import within the cell rather than internal iron redistribution," explains Brumbarova. "From a cellular perspective, this means that controlling the 'external borders' matters most."

The study, which has now been published online in the journal *iScience*, is based entirely on available knowledge. Ivanov says, "All the primary data was already available. We simply examined it from a new angle to answer different questions." As a result, the biologists already have a large dataset that can be used to generate new findings.

More information: Tzvetina Brumbarova et al, The Nutrient Response Transcriptional Regulome of Arabidopsis, *iScience* (2019). [DOI: 10.1016/j.isci.2019.07.045](#)

Provided by Heinrich-Heine University Duesseldorf

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