Science Societies

Improving crops with systems biology

June 16, 2021

Co-author Rajeev Varshney (center) observing a pearl millet panicle and discussing crop productivity with colleagues during a field visit to Sadore, Niamey, Niger. Photo by Nilesh Mishra, ICRISAT.

Recent advances in plant sciences have helped generate various kind of "-omics" datasets from all levels of the cell's biology. For most crops, these datasets were studied in isolation, and complete insight into the molecular basis of complex traits and biological networks remains evasive. A new review in *The Plant Genome* proposes a 360-degree approach to accelerate crop improvement programs.

The proposed "systems biology" approach helps understand a trait in its entirety by combining different "-omics" approaches, including genomics, transcriptomics, epigenomics, proteomics, and metabolomics, with modeling and high-performance computational analysis. Simply put, it is the study of a trait, viewed as an integration and interaction of networks of genes, proteins, and biochemical reactions and influenced by various internal and external environmental inputs.

The authors reviewed progress made by recent omics studies, integrative and systems biology approaches to crop improvement, including some studies undertaken at ICRISAT as part of the Systems Biology Research Initiative. While highlighting challenges and opportunities in multi-omics data integration and modeling, and in understanding the biology of complex traits underpinning yield and stress tolerance in major cereals and legumes, the adoption and integration of a systems biology approach was recommended to accelerate crop improvement.

Dig Deeper

Pazhamala, L.T., Kudapa, H., Weckwerth, W., Millar, A. H., & Varshney, R. K. (2021). Systems biology for crop improvement. *The Plant Genome*. **https://doi.org/10.1002/tpg2.20098**

More science articles

Back to issue

Back to home