frontiers | Frontiers in Sustainable Food Systems

TYPE Editorial
PUBLISHED 27 September 2022
DOI 10.3389/fsufs.2022.1032898

OPEN ACCESS

EDITED AND REVIEWED BY
Raju Datla,
Global Institute for Food Security (GIFS), Canada

*CORRESPONDENCE
Maryke Labuschagne
labuscm@ufs.ac.za

SPECIALTY SECTION
This article was submitted to Crop Biology and Sustainability, a section of the journal Frontiers in Sustainable Food Systems

RECEIVED 31 August 2022
ACCEPTED 14 September 2022
PUBLISHED 27 September 2022

CITATION
Labuschagne M and Mattoo A (2022) Editorial: Insights in crop biology and sustainability: 2021.
Front. Sustain. Food Syst. 6:1032898.
doi: 10.3389/fsufs.2022.1032898

Editorial: Insights in crop biology and sustainability: 2021

Maryke Labuschagne[1]* and Autar Mattoo[2]

[1]Department of Plant Sciences, University of the Free State, Bloemfontein, South Africa, [2]The USDA Sustainable Agricultural Systems Laboratory, ARS, BARC-W, Beltsville, MD, United States

KEYWORDS

biotic and abiotic stressors, sustainability, tolerance mechanisms, crop biology, plant breeding

Editorial on the Research Topic
Insights in crop biology and sustainability: 2021

This is one in a series of Research Topics that highlights the latest advancements in research across the field of sustainable food systems. The focus is on new insights, novel developments, current challenges, recent discoveries, new advances, and future perspectives in the field of Crop Biology and Sustainability.

Six papers were published in this topic. The first was by Biermann et al. on "*Discovering tolerance - a computational approach to assess abiotic stress tolerance in tomato under greenhouse conditions*." They developed a cluster-analysis-based approach that involved principal component analysis, dimension reduction and determination of Euclidean distances as a measure for the phenotypic plasticity in young tomato plants during heat stress. They concluded that multivariate phenotypic data can be useful to overcome challenges of identifying abiotic stress tolerant plants. The second paper was a perspective by Marie et al. about "*A perspective emphasizing circadian rhythm entrainment to ensure sustainable crop production world-wide in controlled environment agriculture: dynamic use of LED cues*." The focus of this paper was the deployment of affordable artificial lighting systems, especially light-emitting diodes (LEDs), in controlled environment agriculture conditions. They found that circadian rhythm traits are good targets for breeders to select new tomato cultivars suitable for controlled environment agriculture such that, through the use of dynamic LED cues, circadian rhythm entrainment can be tailored to crops originating from different latitudes.

A mini-review by Mellidou and Karamanoli titled "*Unlocking PGPR-mediated abiotic stress tolerance: what lies beneath*" focused on plant-associated bacteria, called Plant Growth Promoting Rhizobacteria (PGPR), which have the potential to improve abiotic stress and phytopathogen tolerance. They discussed the current status in the identification and application of novel PGPRs in cultivated plant species under crop limiting conditions. They also highlighted potential challenges of commercializing PGPR as biostimulants for improved crop production under different environmental stress conditions. In addition, they addressed concerns about PGPR application and their impact on ecosystems.

A review "*The bacterial world inside the plant*" by Mendes dos Santos et al. provided an overview of the trends in current research on bacteria in plants. They covered various aspects of endophytes such as what exactly they are, including endophytes in plant organs, endophyte colonization, endophytes and crop nutrition, and nutrient efficiency use. The authors also discussed inoculation with synergistic bacteria and the effect of inoculum concentration on plant root microbiota and synthetic communities. They further reviewed the opportunities and challenges of endophyte use in sustainable agriculture as well as its future applications and impacts in agriculture and the environment.

The review paper on "*Insights on Fructans and Resistance of Plants to Drought Stress*" by Benkeblia aimed to give new insights on the roles of fructans in the response and tolerance of plants to water deficit. They reviewed the role of fructans in protecting plants against water deficit caused by drought, where plants synthesize fructans in response to osmotic pressure in order to osmoregulate the cellular flux, therefore protecting the membrane from damage and maintaining turgor pressure. They concluded that the mechanisms behind this strategy are still unclear.

In the research paper "*Functional characterization of an amaranth Natterin-4-Like-1 gene in Arabidopsis thaliana*" by Cabrales-Orona et al., functional characterization of an *Amaranthus hypochondriacus* Natterin-4-Like-1 gene (AhN4L-1) coding for an unknown function protein characterized by the presence of an aerolysin-like pore-forming domain was determined in addition to two amaranthine-like agglutinin domains. They stated that the role of nattering-like proteins is practically unknown in plants. The study involved gene expression data in grain amaranth and from AhN4L-1-overexpressing *Arabidopsis thaliana* plants, which indicated that this gene was strongly induced by several biotic and abiotic conditions. The data further included the defensive function of this gene, mostly against bacterial and fungal plant pathogens.

This special edition Research Topic sheds light on the progress made in the past decade in the crop biology and sustainability field. In particular, focus was about heat and drought stress tolerance, bacterial and fungal plant pathogen resistance, mechanistical details and challenges in these areas and future prospects in this research field.

Author contributions

ML wrote the editorial, AM edited the editorial. Both authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note