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Editorial

Special issue: Plant synthetic biology☆

This special issue of Current Plant Biology has a collection of **eleven articles** focused on plant synthetic biology. Synthetic biology in plants is a promising field of research that aims to improve the beneficial traits. This growing field involves a multidimensional approach to engineer plants for their optimal use. Plants are being engineered with synthetic components to activate signal transduction pathways leading to desired transcriptional outputs. There is unlimited scope for advancements in the field of plant synthetic biology. Plant cells can naturally harness the energy which could be targeted for diverse outcomes including biomass generation, production of specific novel phytochemicals including pharmaceuticals. Plants could be designed specifically for mass biofuel productions. Gene editing technology like CRISPR/Cas coupled with relatively inexpensive DNA synthesis and genome sequencing is likely to fuel rapid advancement in this field. This special issue highlights articles focused on various areas of plant synthetic biology. We at *Current Plant Biology* sincerely thank all the reviewers who took out time and reviewed manuscripts during this extended COVID-19 pandemic.

The first article of this issue by **Amack** and **Antunes** [1] reviews the current and future use of 35S promoter from cauliflower mosaic virus in plant biotechnology in the context of plant synthetic biology. The 35S promoter is one of the most widely used promoters in generating transgenic plants for the constitutive expression of a transgene. Its use has fueled rapid gene function validations ranging from overexpression of transgenes to gene silencing via RNAi. In the quest for engineering plants with precise outputs similar to electricals circuits as desired by the plant synthetic biologists will require the use of a reliable promoter.

Article by **Miyamoto et al.** [2] describes the role of transcription factor Myb-mediated transcriptional regulation of grass lignins and its direct impact on cell wall biosynthesis/composition. The authors have reviewed the progress made by studying the role of Myb-transcription factors in various plant species including Arabidopsis, Rice, maize, Brachypodium, switchgrass, and other plants.

Birchfield and McIntosh [3] reviewed the metabolic engineering and synthetic biology of four classes of plant natural products that included flavonoids, alkaloids, betalains, and glucosinolates. Development and use of advanced technologies to synthesize these plant natural products which are pharmaceutical precursors, dyes, dietary supplements, cosmetics, fuels, and others are discussed.

Peng et al. [4] describe the RNA-seq transcriptome analysis of Chinese toothed clubmoss, *Huperzia serrata*, a primitive ferm that has been sought and extensively harvested for huperzine A which is used in preventing Alzheimer's disease. Quantitative RT-PCR and metabolite analysis were carried out to elucidate the biosynthesis of huperzine A.

Barone et al. [5] reviewed the complexities involved in the metabolic engineering and production of plant natural products beneficial to humanity. Authors discussed the assembly and use of synthetic metabolons for microbial synthesis of plant natural products.

Iqbal et al. [6] describe the use of genome editing as a new tool to engineer plants for desirable traits. Authors discuss the recent advancements in the gene-editing tools due to progress made in meganucleases, zinc finger nucleases (ZFNs), transcription activator-like effector nucleases (TALENs), and CRISPR.

Kundu and Markkandan [7] describe the characterization of GhMATE1, a citrate transporter that plays a key role in the Aluminum tolerance of cotton. Transgenic RNAi plants lacking GhMATE1 were more susceptible to Aluminum stress while the GhMATE1 overexpressors were more tolerant to the stress.

Varasteh-Shams et al. [8] describe the use of direct and indirect transformation methods in expressing a Dermaseptin B1 recombinant peptide (C2-B1) in tobacco transgenic hairy roots. The authors highlighted the importance of optimization of culture conditions for achieving higher yields.

Article by **Ospanov et. Al.** [9] describes the development and use of plant natural products against the 2019-nCoV pathogen. This review highlights the use of various plant natural compounds and their derivatives in controlling various coronaviruses.

Article by **Sanad** et al. [10] describes the crosstalk regulation model between the abscisic acid (ABA) signaling and peroxisome proliferation/abundance during drought stress response in wheat plants.

Shimelash and **Dessie** [11] describe the novel characteristics of *Phytophthora infestans* causing a late blight on potato in Ethiopia. This study highlights previously unknown variability in *P. infestans*.

Special Issue: Plant Genome Evolution

We are very happy to present 6 articles describing work that has been presented at the last biannual Plant Genome Evolution Conference, which took place in Sitges, Spain, September 29th – October 1st, 2019. Plant genome evolution covers a broad field and this is nicely reflected by a number of interesting papers discussing genetic diversity, adaptation, polyploidy, and even novel ways of studying gene and genome (and plant) evolution, such as, for instance, the 2020 Nobel-awarded CRISPR/CAS genome-editing technology [12–17].

The next and already sixth International conference on Plant Genome Evolution - under the optimistic assumption that international travel will again be possible in 2021, will take place in Dresden

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(Germany), Sunday, October 3rd – Tuesday, October 5th. We are again trying to put together an exciting program focused on different topics such as 'Domestication and Evolution of Crops', 'Decisive Moments and Inventions during Plant Genome Evolution', 'Polyploidy and Hybridization', 'Plant Genome Integrity', and 'Plants and Climate Adaptation', of course, all with a strong emphasis on evolution and evolutionary aspects. More information can be found at https://www.elsevier.com/events/conferences/plant-genome-evolution, and it would be awesome to welcome many of you there. With recently developed technologies such as gene and genome editing and single-cell RNA sequencing, these are exciting times to study plant biology, and particularly plant (genome) adaptation and evolution, topics that will be discussed at length at PGE2021 (#pgev2021).

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