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Editorial: Developing stress resilient crops, improving agri-food industry and healthcare products

The concept of growing plants is not only for consumption as food but has importance in wide perspective of human health and general well-being (Moses and Goossens, 2017). Recent reports are describing the utilization of plant synthetic biology enhancing the ability to fortify crops with nutrients. Thereby, providing alternative source for renewable chemicals, biofuels, bioproducts, intermediate of pharmaceuticals, food ingredients, and health care related products. In this review, the potentiality of plant synthetic biology towards improving human health by generating plants that produce pharmaceuticals, nutrients, and nutraceuticals has been described. Additionally, the technological challenges hindering the ability to generate plants producing health-promoting small molecules have also been reviewed (Barnum et al., 2021). Plants respond to biotic and abiotic stressors with a range of chemical signals (Coatsworth et al., 2023). A review describing the advances in continuous monitoring of chemical signals like ions, organic molecules, inorganic molecules and radicals, as well as current challenges and future perspectives for chemical signals monitoring in living plants under stresses has been published (Coatsworth et al., 2023).

It is noteworthy that nanotechnology-based approaches have shown encouraging results on sustainable agricultural production. Innovating nanoformulations for the targeted delivery may minimize the emission of greenhouse gases. The nanomaterial contents in the resulting nanofertilizers or pesticides can further do improvement (Su et al., 2022). Recently Qiao et al. (2022) reported the importance of vegetable oils for industrial applications along with its role in human diet. The detailed structural basis of Arabidopsis WRINKLED1 (WRI1, an essential transcription factor that regulate the plant oil biosynthesis) recognition and binding of DNA towards increasing the oil yield in crops through WRI1 bioengineering has been described (Qiao et al., 2022). RNA-guided CRISPR activation (CRISPRa) systems in plants capable of activating multiple genes simultaneously have been developed. A highly robust CRISPRa system (CRISPR–Act3.0) has been described in rice, *Arabidopsis* and tomato by exploring different effector recruitment strategies and transcription activators based on deactivated *Streptococcus pyogenes* Cas9, dSpCas9 (Pan et al., 2021). Another versatile genome engineering tool, namely CRISPR-Combo platform, having promising applications in crop breeding has been developed. This CRISPR-Combo is based on a single Cas9 protein which is capable to do genome editing and gene activation in plants simultaneously (Pan et al., 2022).

Although, significant efforts are being carried all over the world to use the barren land and to improve the quality of less fertile land for better agricultural production. However, ample opportunities, as well as public awareness, need to be explored to improve the agricultural land and crop production, increasing agri-food industry to ensure overall food security as well as health care products despite of the challenges of changing climate. Considering the above challenges an International Symposium on Plant Biotechnology Towards Improving Agri-Food Industry and Healthcare Products (ISPB-2021) was organized at Birla Institute of Technology, Mesra, Ranchi, Jharkhand, India from October 27–30, 2021, covering various thrust areas, like stress response, genomics, gene expression, genome editing, crop improvement and breeding, proteomics, metabolomics, computational biology and bioinformatics, plant biotechnology, functional and processed food, plant based biofuel, smart farming, data science, nanobiotechnology, natural plant chemicals, plant tissue culture, metabolic engineering, sericulture, lac culture, forest engineering, biophysics in agriculture, biosensors, biomedical agriculture and policy issues in biotechnology. Considering the very diverse research domain, a special issue entitled "Developing Stress Resilient Crops, Improving Agri-Food Industry and Healthcare Products" was subsequently created. The editors of this special issue gratefully acknowledge and appreciate the efforts of Dr. Christoph Wilhelm Sensen, Hungarian Centre of Excellence for Molecular Medicine and Editor-in-Chief, Journal of Biotechnology for accepting the proposal in an special issue of this prestigious Journal. The present Research Topic (RT) aimed to address the existing gaps and formulate the strategies towards better plantation, growing of crops, enhancing the crop production under unfavorable environmental conditions as well as increasing agri-food industry and plant-based health care products.

In this RT, a review describing the in vitro tissue culture perspectives of *Stevia rebaudiana* for scale-up production of this sweetener plant by optimizing mineral nutritions, growth regulators and optimum growth conditions that leads to generate high metabolite yielding plants has been published (Srivastava and Chaturvedi, 2022). The efficient uses of CRISPR/Cas Technology in diagnosis, namely SHERLOCK, DETECTR and SATORI, through identification of specific nucleic acids and processing the detectable signals have been described. This cost-effective detection of contaminating viruses may also be very beneficial in agro-based industries (Prasad et al., 2022). A review describing anthocyanin mediated stress tolerance in plants under various abiotic and biotic stresses has been published. Here, genetically engineered stress-tolerant crops that were generated using over-expression of genes associated with anthocyanin biosynthetic pathway and its regulation have been reviewed (Kaur et al., 2023). *In vitro* production of doubled haploid plants in two tea (Camellia spp) cultivars namely TV21 (Assam Type) and TV19 (Cambod Type) have been established from pollen grains in *in vitro* anther cultures (Bajpai and Chaturvedi, 2023). The importance of 1-aminocyclopropane-1-carboxylate deaminase (ACCD)-producing plant growth-promoting bacteria (PGPB) for their

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ability to reduce ethylene production and the promotion of plant growth under stress conditions as well as possibility to develop the transgenic plants by overexpressing bacterial *AcdS* gene towards improving their performance under stress conditions has been reviewed (Singh et al., 2022). Also, another review describing the important nanomaterials which are used in agriculture as nanofertilizers, nanopesticides, and a combination called nanobiofertilizers has been published (Arora et al., 2022). The necessity for the inclusion of robotics and agrochemical-free genetically modified (GM) seed to enhance the efficiency of organic agriculture has been reviewed. It shows that organic-GM hybrid agriculture systems, integrated with the use of artificial intelligence (AI) based technologies, will yield better energy efficiency (Husaini and Sohail, 2023). Cocoonase is a proteolytic enzyme which acts on sericin protein and helps in silk cocoon degumming. Similar to cocoonase, trypsin is another proteolytic enzyme that might be used for silk cocoon degumming. The interaction mechanism between trypsin enzyme and the sericin protein substrate was assessed by studying the physico-chemical properties, biophysical properties, dynamics, gene ontology, molecular docking, protein – protein interactions, binding free energy calculation and structural motifs. The *in-silico* result predicted the remarkable similarity with cocoonase and trypsin. Hence, trypsin might be used as an alternative source in cocoon degumming (Sneha et al., 2022) and requires experimental validation.

The collection of all papers that have been included in the present RT are providing information on a wide and diverse range of modern technologies, scientific approaches and research ideas meant towards developing stress resilient crops, improving agri-food industry and healthcare products. The editors sincerely thank authors for submitting their contributions in this special issue, reviewers for their valuable and timely inputs on the submitted manuscripts, Dr. Maria Sensen, Managing Editor and associated officials of the Journal of Biotechnology.

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