



Editorial

Genetic intervention, popularly known as genetic engineering, genetic modification, genetic manipulation or genetic interference, is the manipulation of any organism's genes—from bacteria to humans to plants—using recombinant DNA technology. The earlier perceptions of engineering plants are well known since very pre-historic time when manmade interventions through selective breeding have led to the domestication of crop plants with higher yields and quality. Subsequently, the plant breeders played a vital role in improving the crop plants in terms of productivity, quality and architecture, etc., which have contributed enormously for global food security. In the recent past, we have witnessed genetic and biotechnological interventions, viz., transgenic, RNA interference (RNAi), and genome editing technology, significantly contributing to crop improvement, and possessing a great potential to develop engineered crops for several new traits, including yield, quality, and stress tolerance. These technologies coupled with traditional plant breeding methods will certainly help in solving the global food security problem in a sustainable manner as there is a huge gap between the food production and population growth rate. In fact, approximately 70% increase in food production is needed by 2050 to feed a world population of 9.7 billion; otherwise, we may face great famines in the near future. Indeed, this warrants that a second green revolution, at least in India, is the need of the hour for food security. In view of the importance of this field, a national workshop on “Regulatory Mechanisms, Transgenic Technology and Applications in Plants” was jointly organized by the Department of Botany and Microbiology, Acharya Nagarjuna University, Nagarjuna Nagar, Guntur, Andhra Pradesh, and Indian Institute of Science Education and Research (IISER), Mangalam, Tirupati, Andhra Pradesh, during 2–3 August 2018. Dr. K. Mallikarjuna and Dr. Eswarayya Rami Reddy were Convener and Co-convener of this workshop from the above mentioned organizations respectively. Special thanks are due to Prof. B. J. Rao, IISER, Tirupati, and Vice-Chancellor, Registrar, Head, Department of Botany and Microbiology, and members of the organizing committee, Acharya Nagarjuna University for their help in facilitating the above cited workshop. The organizers of the workshop had decided to publish the proceedings of the meeting as a special issue of the *Journal of Biosciences* entitled “Genetic Intervention in Plants: Mechanisms and Benefits”. As a standard practice in the *Journal of Biosciences*, all the articles in the special issue have been duly peer reviewed.

Eleven articles (10 review articles and 1 research article) have been received from the invited speakers of this workshop, spanning the cutting-edge research in the field of molecular markers, phenomics, promoters, molecular biology, transgenic crops, RNAi technology, and genome editing in plants. Ramesh *et al.* (Yogi Vemana University, Kadapa, AP) presented the advancements in the popular molecular markers for crop diversity studies and their application in crop breeding for crop improvement programs; Pasala and Pandey (ICAR_IOR, Hyderabad) have presented a short review on the recent advances in plant phenomics, and highlighted different field and confined high-throughput technologies for use in forward and reverse genetics that relevance in stress identification, study physiological processes, rapid and efficient screening, dissection and conformation for understanding the genetic basis of different traits, genes and aspects; Kummari *et al.* (ICRISAT, Patancheru, Hyderabad) provided a comprehensive overview of promoters in plants, their selection, specificity, cross activity, and how they can be useful in maximizing the transgene expression for potential applications in crop improvement programs; Talakayala *et al.* (Agri Biotech Foundation, Hyderabad) focused on different strategies for developing transgenics against insect pest control by expressing different insecticidal proteins in crops; Suprasanna (BARC, Mumbai) has discussed the various mechanisms by which plants cope with abiotic stress conditions and

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summarized the approaches that have played significant role in developing tolerant lines in crop plants; Rajam (University of Delhi South Campus) presented a short review on the RNAi technology, which is an emerging tool for the control of pathogens and pests; Ashfaq *et al.* (ICAR-IIOR, Hyderabad) have outlined the basics of post-transcriptional gene silencing (PTGS)/RNAi and summarized the work being carried out at their institute using this approach, as case studies, including the restoration of fertility in transgenic male sterile lines, suppression of the production of toxic proteins, ricin and RCA in castor and developing bud necrosis virus resistance in sunflower, besides the examples from other plant systems; Kaur *et al.* (University of Delhi South Campus) focused on the current understanding of biogenesis of plant miRNAs and their function, and recent genetic engineering studies encompassing their role in enhancing rice yield via manipulation of plant architecture; Kaul *et al.* (ICGEB, New Delhi) highlighted the recent progress in the nutritional improvement of crops employing the genome editing (CRISPR-Cas) tools for basic plant research and crop genetic improvement, and discussed the application of this genome editing aids in unraveling the basic biology facts in plants with the integration of genome-wide analyses, machine learning, and numerous bioinformatics platforms, and strategies for reducing the “off-target” effects and the social acceptance of genome-edited crops; Mallikarjuna *et al.* (Acharya Nagarjuna University, Guntur, AP) have provided the complete information pertaining to the core-CO₂ Concentration Mechanisms (CCMs). In addition, they have also provided information on CO₂/HCO₃⁻-sensing, photo-acclimation in low-CO₂, liquid-like nature of pyrenoid, untapped potential of high CO₂ responses and high CO₂ requiring mutants, and prospects of engineering CCM components into higher plants; and Jaiwal *et al.* (University of Delhi South Campus) have presented their research work on the screening of six hormonal biosynthetic genes of *Helicoverpa armigera* by feeding dsRNAs corresponding to each target gene, and demonstrated that the selected hormonal genes are vital and can be potential targets for developing insect-resistant RNAi transgenic lines to prevent massive losses to cotton and other important crops by the insect pest, *H. armigera*.

The articles of this special issue will be very useful for the scientists and research scholars working in the field of genetic manipulation in plants for crop improvement from both public and private organizations. I thank the organizers of the workshop for inviting me to be a guest editor for this special issue, and *Journal of Biosciences* Chief Editor Prof. B. J. Rao and the Staff of the *Journal of Biosciences*, Jai Benjamin and Sushila Rajagopal, for extending their support for timely completion of this special issue. I am grateful to all the authors and co-authors for their contributions, and reviewers for their valuable comments on the manuscripts.

Guest Editor

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