Jitendra Paul Khurana (1954–2021)

Jitendra Paul Khurana, one of India's outstanding plant biologists and an internationally reputed scientist, died on 27 October 2021 at the age of 66 years. We had a long association with him, almost since the time he started his Ph.D. at the University of Delhi. His passion for research and teaching, and involvement in his work were exemplary and an inspiration to all of us. Even while bearing the pain related to his health for almost a year, Khurana was enthusiastically busy in finalizing manuscripts of his interesting research outcome on the functional genomics of development in rice. He was keen to get back to the laboratory to work with his students, and had planned to expand his earlier work on *Arabidopsis* mutants with full intellectual vigour. All of us expected several more years of productive work from his laboratory. His sudden demise is an irreparable loss to plant biology, to which he devoted most of time and attention, and to us as a valuable and knowledgeable friend and colleague.

Born on 30 October 1954 in Amritsar, Punjab, Khurana did his B.Sc. from the University of Delhi in 1973 and M.Sc. from Kurukshetra University, Haryana, in 1975. He returned to the University of Delhi to complete his Ph.D., under the guidance of Prof. S. C. Maheshwari, who was also our thesis advisor. After finishing his doctorate, Khurana worked at the University of Delhi before proceeding on a postdoctoral fellowship at Smithsonian Institution, Washington, DC, USA (1985–86), where he worked with Dr Charles Cleland and at the Plant Research Laboratory, Michigan State University, East Lansing, USA (1986–88), where he worked with Prof. Kenneth Poff. His other foreign academic visits included the FERRO Fellowship to United States Department of Agriculture (USDA), Beltsville, in the laboratory of Dr Autar Mattoo, and as Visiting Professor to Waksman Institute, Rutgers University, USA, with Prof Joachim Messing.

Khurana was one of the founding members of the newly established Department of Plant Molecular Biology at the University of Delhi, South Campus, New Delhi in 1988. He became Professor in 1996 and served the University as Head of the Department; Chairman, Board of Research Studies in Interdisciplinary and Applied Sciences; Director, Interdisciplinary Centre for Plant Genomics; Dean, Faculty of Interdisciplinary and Applied Sciences; Director, South Campus, and Dean, Colleges (officiating) and Pro-Vice Chancellor (officiating) at the University of Delhi. He served as Chair or member of several national-level committees related to organizations like CSIR, DBT, DST, ICAR, SERB and UGC. Notably, he served as President, Indian Photobiology Society; General Secretary, National Academy of Sciences, India; Vice-President, Indian National Science Academy, and Secretary, Plant Tissue Culture Association (India), among other distinctions.

Khurana carried out outstanding research during a period of 45 years. Some of these include establishment of the role of salicylic acid in the induction of flowering in one of the smallest plants, *Wolffia* during Ph.D. work. Later, he provided evidence that it acts as a signal during biotic stress. Khurana pioneered research on several determinants in *Arabidopsis* involved in light, hormone and sugar signalling. One of the mutants he isolated, which was initially named as JK224, led to the identification of a novel blue light photoreceptor, phototropin 1, which primarily controls phototropism and leaf orientation to capture maximal solar energy for photosynthesis. Recently, his group has demonstrated the role of other blue light receptors, cryptochrome 1 (CRY1), in controlling plant height and CRY2 in regulating flowering time, in mustard. His work also shed light on the emerging role of plant hormones under abiotic stress in plants. OsRR6, a cytokinin response regulator, was shown to mediate light and stress responses in *Arabidopsis*. Drought-induced-19 (Di19-3) was identified as an interacting partner of IAA14 (auxin/indoleacetic acid 14 protein) and its role in regulating auxin signalling and ethylene-induced responses in *Arabidopsis* was demonstrated. His work on light and hormone signalling in plant development has been well recognized.

Khurana also played a key role in the sequencing of rice, tomato and wheat genomes, as a part of international consortia, and took upon himself to gain first-hand exposure to high-throughput DNA sequencing at Rutgers University, USA. The genomic resources generated are being globally used to identify genes of agronomic importance. Several auxin-inducible gene families and a homeobox gene family were explored in rice from the viewpoint of evolutionary expansion, phylogenetic relationship and expression profile during development. The microarray-based expression analysis of bZIP and F-box protein coding genes provided evidence for the probable role of a subset of these genes in regulating panicle and seed development in rice. Khurana extensively carried out functional genomics work. To begin with, functional significance of a Polycomb group gene, *OsiEZ1*, was established. OsbZIP62, serves as Flowering Locus D (FD), preferentially expresses in the shoot apical meristem and interacts with the mobile flowering signal 'florigen' (FT) to regulate transition to flowering and panicle development in rice. An F-box protein, OsFBK1, has been ascribed a novel function in regulating anther dehiscence and root lignification. Besides, OsZIP1 and OsZIP48 have been found to control plant height in rice. Attention was also paid to stress responses in plants and Khurana's group established the role of three topoisomerase 6 subunit genes from rice in conferring stress tolerance using *Arabidopsis* as a transgenic system and identified candidate genes for abiotic stress tolerance by comparative transcriptome analysis of stress-tolerant varieties. His work in the area of plant biology has been published in over 200 publications of international repute.

Khurana was an excellent teacher in the area of development and signalling and has guided of over 30 Ph.D., 10 M.Phil., 30 M.Sc. and 26 postdoctoral students. Many

of his students occupy significant academic and research positions in several institutions in India and abroad. He has helped organize and has delivered more than 300 lectures in national/international meetings. Another major contribution of Khurana has been to help improve the quality of several journals published from India by serving on their editorial boards. He had recently jointly edited a special issue of the *Journal of Plant Biochemistry and Biotechnology*.

It is natural that such a significant contribution would attract several awards and recognitions. Khurana was elected to the fellowship of all three national science academies, National Academy of Agricultural Sciences, and The World Academy of Sciences. He received several awards, including the J.C. Bose National Fellowship, TATA Innovation Fellowship, Birbal Sahni Medal, Goyal Prize, Shri Omprakash Bhasin Award, Nishtha Dhritih Satyam Samman and a large number of Memorial Lecture Awards, among others, for his outstanding contributions.

Equally important is to mention the humane aspects of Khurana's persona. He touched everyone's life with positivity; and his friendly disposition and helpful nature are admired by everyone. It is expected that his students and colleagues will carry forward the unparalleled legacy of Khurana by extending a wholesome approach to studying plant functions and maintaining high human values.

Khurana is survived by his wife Paramjit, a leading plant molecular biologist, a son and a daughter.

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