PROF. RAJEEV VARSHNEY

Driven by Greater Good

Prof. Rajeev Varshney grew up in a middle-class family in Bahjoi, a small town in Uttar Pradesh. His father Kishan Lal had a small-scale business and mother Bhagwan Devi was a homemaker. After completing his primary schooling in Bahjoi, he received his bachelor's and master's degree from the Aligarh Muslim University (AMU) in 1993 and 1995, respectively. While pursuing his PhD degree, he worked as a junior/senior research fellow on an R&D project sponsored by Department of Biotechnology under the supervision of Prof. PK Gupta, a well-known name in the field of plant genetics, and Prof. PC Sharma, who became the driving factors behind his choice of career. After receiving his PhD degree in 2001, he joined Leibniz Institute of Plant Genetics & Crop Plant Research (IPK), Gatersleben, Germany, as a post-doctoral research scientist under mentorship of Prof. Andreas Graner.

> **"Give your 100 per cent to any project or activity and but also enjoy while doing that."**

During his stint in Germany, he feels, he found his eureka moment that shaped his research career. He recalls, Prof. Norman Borlaug, a renowned agricultural scientist, whom he heard during a conference in Italy in 2003, challenged the next generation of scientists to embrace new tools and technologies to tackle food security issues in the developing world. These words inspired and motivated him to work on translational aspects of upstream research for development of better crop varieties with improved yield and nutrition in developing countries. As a result, Prof. Varshney joined International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in 2005 and since then he has been working as a researcher, science administrator and thoughtleader in the field of international agriculture.

Prof. Varshney is a firm believer in harnessing the potential of modern genomics tools and molecular breeding approaches as a game changer for accelerated development and delivery of improved crop varieties. To achieve this, the first step is to have the genome sequence and genetic knowledge of agronomic traits in a crop species. In this direction, Prof. Varshney, with Prof. Andreas Graner and Prof. Mark Sorrells, devised the concept of genomics-assisted breeding (GAB) and presented it as a milestone future approach in the 10th anniversary issue of *Trends in Plant Science*, 'Feeding the World: Plant Biotechnology Milestones' in 2005. With changes in time and evolution of technologies, Prof. Varshney with his collaborators, from India and aboard, updated GAB to GAB 2.0, and also provided new concepts, such as 5Gs for crop genetic improvement and the most recent one being fast-forward breeding for a food-secure world.

After joining ICRISAT in 2005, Prof. Varshney was given the responsibility to lead the genomics research on ICRISAT's mandate crops, which include legumes (chickpea, pigeon pea, groundnut) and cereals (pearl millet and sorghum) that are staple and income-generating crops for small-holder farmers in the semi-arid tropic regions of the word. With an objective to implement GAB in crop improvement, majority of these crops did not have much genomic resources and were often referred to as 'orphan crops'. A zeal, to help small-holder farmers by enhancing crop productivity, encouraged Prof. Varshney to work on advancing genomics science and integrated it in crop improvement in ICRISAT mandate crops.

While, Prof. Varshney and his team/collaborators decoded genomes of more than 10 crops, which are advancing plant biology and providing cues about molecular mechanism of the tolerance/resistance to abiotic and biotic stresses at international level. On the other hand, adoption and deployment of genomics discoveries in crop breeding programmes at national level have delivered several improved varieties contributing towards food and nutrition security. For example, in the last 3 years, GAB has delivered 7 high-yielding drought-tolerant varieties of chickpeas, namely, 'Pusa 10216', 'IPC L 4-14' and 'BG 4005', and Fusarium wilt-resistant varieties like 'Super Annigeri-1', 'Pusa Chickpea 2021I' (aka Pusa Chickpea Manav) and 'IPCMB 19-3' in India; a drought-tolerant variety 'Geletu' in Ethiopia; 2 high Oleic groundnut varieties –Girnar 4 and Girnar 5; and, 2 Fusarium wilt-resistant pigeon pea varieties, namely, Bheema, (GRG-152) and TDRG 59 in India. Now several national institutes are using GAB approaches in their crop improvement programmes. In addition, ICRISAT has won the prestigious Africa Food Prize 2021 for work under the Tropical Legumes (TL) projects, led by Prof. Varshney as Principal Investigator for a period of 7 years (2013-20).

Clockwise: Receiving the ICRISAT's Doreen Margaret Mashler Award, 2016

Gathering hands-on experience in the ICRISAT CEGSB lab

In deep discussion with his collaborators in Nigeria

Being felicitated by UP Chief Minister Yogi Adityanath, Governor Ram Naik and others

With Prime Minister Narendra Modi and other Shanti Swarup Bhatnagar awardees

Inset: With Bill Gates after a brainstorming meeting on digital revolution for agriculture

AWARDS

- Shanti Swarup Bhatnagar Award (2015)
- Rafi Ahmed Kidwai Award (2020)
- Qilu Friendship Award (2016)
- GD Birla Award for Scientific Research (2018)
- Fellow of 12 international and national science academies including INSA (2013), NASI (2015), IASc (2019), NAAS (2010), German National Science Academy (2016), Africa Academy of Sciences (2021)

PUBLICATIONS

- 'Draft genome sequence of chickpea (Cicer arietinum) provides a resource for trait improvement'. *Nature Biotechnology* (2013).
- 'Resequencing of 429 chickpea accessions from 45 countries provides insights into genome diversity, domestication and agronomic traits'. *Nature Genetics* (2019).
- 'A chickpea genetic variation map based on sequencing of 3,366 genomes'. *Nature* (2021).

Prof. Varshney has established and continues to nurture a huge network of >180 partners from 35+ countries across six continents. He has published >500 papers in high impact factor journals, including 19 papers in Nature journals. He is the only Indian agricultural scientist/plant biologist who has h-Index >100 with >45,000 citations. He is an editor of 17 books from international publishers. Thomson Reuters (Clarivate Analytics) has recognized him as a highly cited researcher for the last 8 years in a row. He is also recognized as one of the 10 most influential Indian scientists by *The Times of India*, a leading Indian daily newspaper.

To provide new insights, his team has recently completed sequencing of 3,000 chickpea accessions and looks forward to sequencing the remaining 10,000 to 15,000 accessions in the coming years. He is working to explore deploying machine learning and artificial intelligence approaches by using high-density genomics and large-scale phenotyping data for crop improvement. •