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India takes lead in decoding 'Kabuli Channa'

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The sequencing of the 90 chick pea genomes that was published online on 27 January 2013 in *Nature Biotechnology*, is widely seen as a step towards improved grain yields and quality, greater drought tolerance and disease resistance, and enhanced genetic diversity. The findings in highest ranked biotech journal, featured the reference genome of the CDC Frontier chickpea variety (a kabuli variety) and genome sequence of ninety cultivated and wild genotypes from ten different countries, as an online publication. The research milestone was the result of years of genome analysis by the International Chickpea Genome Sequencing Consortium (ICGSC) led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) headquartered in Hyderabad, Andhra Pradesh India, involving 49 scientists from 23 organizations in ten countries.

The informtion was revealed to media at New Delhi on January 28, 2013 by Dr William Dar, director general, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Dr Dar told mediapersons that all the partners have played an equally important role and have once again demonstrated the power of productive partnerships by achieving this breakthrough in legume genomics." On being asked about the long term impact of the findings on farmers, Dr Dar told *BioSpectrum*, "The sequencing will play a crucial role in speeding up the development of improved varieties for smallholder farmer crops such as chickpea.We are also looking at taking up similar initiatives for the neglected crops grown by the marginal farmers."

Dr Rajeev Varshney, coordinator of ICGSC and director - center of excellence in genomics, ICRISAT who led the efforts from Indian side, explained,"Genetic diversity, an important prerequisite for crop improvement, is very limited and has been a serious constraint for chickpea improvement. This study will provide not only access to 'good genes' to speed up breeding, but also to genomic regions that will bring genetic diversity back from landraces or wild species to breeding lines."

The global research partnership succeeded in identifying an estimated 28,269 genes of chickpea after sequencing CDC Frontier, a kabuli (large-seeded) chickpea variety. Re-sequencing of additional 90 genotypes provided millions of genetic markers and low diversity genome regions that may be used in the development of superior varieties with enhanced drought tolerance and disease resistance. The findings can be useful to crop improvement for sustainable and resilient food

production toward improved livelihoods of smallholder farmers particularly in marginal environments of Asia and sub-Saharan Africa.

The Bill and Melinda Gates Foundation (BMGF) also played a key role in funding the initiative. According to Dr David Bergvinson, Senior Programme Manager, Science & Technology, Global Development, BMGF, "Making the chickpea genome available to the global research community is an important milestone in bringing chickpea improvement into the 21st century to address nutritional security of the poor - especially the rural poor in South Asia. We look forward to seeing how researchers around the globe will harness this resource to increase chickpea productivity against the backdrop of climate change in the developing world."

ICRISAT in its release noted that the renowned agricultural scientist and member of Indian parliament, Prof MS Swaminathan has appreciated and congratulated its team for the breakthrough. It quoted Dr Swaminathan as saying that chickpea occupied a pride of place in the struggle against protein hunger. "I am confident that the knowledge provided by this study will help accelerate the improvement of this crop through marker-assisted breeding," mentioned Dr Swaminathan.

Recognizing the efforts of the global research team, Mr Ashish Bahuguna, secretary, ministry of agriculture, government of India says, "Decoding of the chickpea genome would facilitate the development of improved varieties with higher yields and greater tolerance to biotic and abiotic stresses. This would help chickpea farmers to increase productivity, reduce cost of inputs and realize higher incomes."

Dr Swapan Datta, deputy director general - crop science, Indian Council of Agricultural Research (ICAR), highlighted the importance of the breakthrough to India. "The chickpea genome sequence is expected to help in the development of superior varieties with enhanced tolerance to drought and resistance to several biotic stresses. India will benefit most from this genome sequence, our country being the largest producer of chickpea. This, in my opinion, is by far the most significant collaboration between ICAR, ICRISAT and the global genomics community."

The highly nutritious, drought-tolerant chickpea contributes to income generation and improved livelihoods of smallholder farmers in African countries like Ethiopia, Tanzania and Kenya, and is crucial to the food security in India (being the largest producer, consumer and importer of the crop). Chickpea is also an important component of the pulse industry in Australia, Canada and USA.

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The initiative was funded by the CGIAR Generation Challenge Programme (GCP), US National Science Foundation (NSF), Saskatchewan Pulse Growers (Canada), Grains Resource Development Corporation (Australia), Indo-German Science Technology Corporation (Germany and India), National Institute for Agricultural and Food Research and Technology (Spain), National Research Initiative of US Department of Agriculture's National Institute of Food and Agriculture (USA), Ministry of Education, Youth and Sports of the Czech Republic and the European Regional Development Fund, University of Cordoba, ICAR (India), BGI (China) and ICRISAT.

Chickpea is the second largest cultivated grain food legume in the world, grown in about 11.5 million hectares mostly by resource poor farmers in the semi-arid tropics. The highly nutritious, drought-tolerant chickpea contributes to income generation and improved livelihoods of smallholder farmers in African countries like Ethiopia, Tanzania and Kenya, and is crucial to the food security in India (being the largest producer, consumer and importer of the crop). Chickpea is also an important component of the pulse industry in Australia, Canada and USA.