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Drought-tolerant rice genotypes

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Despite being an agrarian economy, India continues to remain largely dependent on the unpredictable monsoons. Every year, due to adverse climate phenomena, farmers face huge crop loss owing to lack of adequate irrigation. With such a scenario, Bioseed Research India (BRI), a Hyderabad-based company and International Centre for Genetic Engineering and Biotechnology (ICGEB) joined hands to find a possible solution.

Dr Paresh Verma, research director, Bioseed Reseach India, said that the work on developing drought tolerant genotypes was undertaken keeping in mind the Indian requirements. He added, "The frequency and intensity of drought is increasing by the day. Water resources are getting exhausted and even those areas which have access to water, lack power supply to irrigate their fields. In such a scenario, research on drought tolerant varieties of essential crops like rice can be very critical."

In 2007, Bioseed Research India applied for and was successfully awarded a Small Business Innovation Research Initiative (SBIRI) grant amounting to Rs5.35 lakh, more than two-thrids of which was in the form of grant and soft loans to the two research organizations for developing drought-tolerant varieties of rice in association with ICGEB. Scientists at the Plant Molecular Biology Laboratory in ICGEB, through painstaking research, isolated several genes that were thought to provide tolerance to crops in drought conditions. A team of researchers at BRI then transferred these genes to the relevant plant species using genetic techniques. Proof-of-concept studies carried out in controlled conditions helped them narrow down to three genes that were showing measurable activity in the plants. Since drought tolerance is a complex trait, no single gene is said to confer tolerance in a plant. Hence these isolated genes are assumed to play a complementary role in conferring tolerance.

The ambitious project was completed in 2011 and as a testimony to its success and innovative nature, ICGEB and BRI were awarded the 'Best Innovation in Agriculture Sector' award at the Innovator 2012 Awards organized by BIRAC.

Way forward

The work on this project, however is far from complete. BRI has now embarked on taking it further by accomplishing several tasks with DBT's support. Firstly, in collaboration with ICGEB, the three genes that were selected will now be stacked, allowing easy transfer into the plant species. Secondly, researchers have initiated the development of transgenic marker- free plants, that will possess the drought tolerance genes, but not any marker genes used for selection, antibiotic or otherwise. The first field trials for this variety are expected to be carried out in the coming year. Following other studies and approvals, it would take another 4-5 years for the seeds to reach the market. Separately, BRI has also started developing drought-tolerant hybrids using traditional techniques.

About public private partnerships, Dr Verma said that, the complementary nature of both the participating entities' strengths has helped them achieve their goals. "Public institutions, though very proficient in basic research lack the resources and capability to move into product development. The private partner, however has a connect with the end user, the farmer. In our case, we had a strong breeding program and good bank of germplasms, which helped us take the initial research forward."