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Drought tolerant maize to insure farmers from crop failures

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Maize is mostly grown as a rain-fed crop in India, and during Kharif season every year, out of which nearly 60 percent of the area is sown. In most of the areas, expansion happens in Kharif season, since Kharif is considered as the most favorable season for maize.

However, Kharif season crops are mostly vulnerable to drought conditions because of scanty rains coupled with poorly distributed rainfall patterns. Development of drought tolerant maize is an important need for helping India to stabilize maize production, and insure farmers from total crop failure.

In this project, the main objective was to identify candidate gene markers for further development of breeder ready markers for traits of interest and identification of inbred lines with enhanced pace and ultimately develop drought tolerant hybrids.

The project was initiated in December 2012. This project has been in collaboration with CIMMYT with DBT's assistance on association mapping and whole genome MARS for the development of abiotic stress resilient Maize.

Dr Vivek and Dr Girish Krishna from CIMMYT and Dr B Muralidhara Rao from GEO Biotechnologies had initiated this project.

The project was aimed at bringing in drought tolerant hybrid maize seeds and develop drought tolerant maize hybrids which can be commercially sold to the farmers.

The outcomes and the methodology adopted in this project will benefit research in the area of developing drought tolerant crops in the future.

Mr KS Narayanaswamy, chairman and CEO, GEO Biotechnologies India, said, "Public-private partnerships will go a long way in the development of biotech industry in India. Better quality of work, application of technology, and efficient use of infrastructure have been the benefits. The partnerships are only recent in many cases, and the outcomes will enhance the associations to a greater extent over a period of time."

At present, evaluation of the test crosses obtained by crossing 325 CIMMYT-inbred lines and 75 GEOinbred lines with two testers is in progress at five locations, namely Motebennur, Dharwad, Bangalore, Warangal and ICRISAT, Hyderabad.

Leaf sample analysis for cellular level tolerance, waxy layer, C and O isotope discrimination is underway. The leaf samples have already been sent for outsource genotyping using 55K chip.

The estimated total project cost across all phases has been about `140 crore. The initial funding amount approval of `14.29 crore was received collectively by GEO and CIMMYT.

The funding has helped GEO in meeting the total expenditure on phenotyping cost by testing the test crosses in multi-location sites corresponding to various varying agro-climatic conditions.

The project had Dr KS Narayanaswamy, CMD, GEO Biotechnologies, receiving project support from Dr CS Prakash, plant biotechnology professor, Tuskeegee University, USA.

The team also consisted of Dr B Muralidhara Rao, GM (R&D), GEO Biotechnologies, having more than 26 years of experience in maize breeding, Dr BS Vivek, senior maize breeder, CIMMYT, Hyderabad, who has been working at CIMMYT, Mexico, for the last 20 years in maize breeding, and Dr Girish Kumar Krishna, maize molecular breeding scientist, CIMMYT, Hyderabad.

CIMMYT being a CGIAR institute and this was a new collaboration, the project had issues of IP and fund transfer before signing the MoU, which was resolved with the intervention of DBT.

During the project course, it was difficult for researchers in finalizing suitable farmers' fields for conducting multi-location testing of test crosses. Association of a progressive farmer in each test location was considered all the more important for this purpose.

However, this task was made easy through the help of field staff. The economic significance of this project is evaluated in three paradigms.

The farmers will receive higher yields in growing maize during adverse climatic conditions. The research will also contribute in terms of food security aspect of the country, ensuring grain productivity, and provision of fodder for animal husbandry activities during inadequate rainfall.

Also, the overall increase in maize growing areas can also be attributed as farmers who would previously not prefer to grow maize because of higher water consumption can look at the crop as a viable option.

This proposed project will also lead to identification of candidate gene markers for further development of 'breeder ready' markers for traits of interest and also identification of inbreds with enhanced pace.

The proposed approach would help in identifying practically usable markers for development of inbreds, and ultimately

hybrids meeting the farmers'and seed industry needs.

GEO has also collaborated with University of Agricultural Sciences (UAS) Bangalore, for developing tomato hybrids with fruits having higher shelf life.

The Small Business Innovation Research Initiative (SBIRI) has been approached for funding of the project. GEO is also looking forward for its projects in rice and sunflower, which are at a conceptual stage for a PPP with BIRAC.