The Hindu: Tuesday, August 7, 2001

# Benefiting from GE crops

**GE technology has shown promise of reducing the farm production costs by minimising the use of chemical pesticides, simplifying agronomic practices, improving productivity or by enhancing the value of crops.**

INDIAN FARMERS will immensely benefit if they are empowered with genetically engineered (GE) seeds that have capacities to work with relatively fewer inputs. The green revolution, which is based on conventional methods of breeding and selection, has reached a plateau. Excessive use of fertilizers has caused land degradation, manifesting salinity and alkalinity. Pesticides, though efficacious, have caused enormous damage because of non-judicious use or have accidentally impacted non-target organisms. Productive seeds with quality traits to match the above adversities can be developed by using genetic engineering technology. In this technology, a useful gene coding for a property is inserted into the plant using a plant compatible promoter and a terminator sequence. Genes, promoters and terminators are DNA sequences having different properties. The genes used are obtained from non-related but natural organisms. They can also be synthesised in the laboratory. The promoter sequence directs the genes to work. The implantation of the genes into non-related plants by different non-sexual methods has been possible in GE technology. This technology has major advantages over breeding methods in scope, reliability, precision and speed.

GE technology has shown promise of reducing the agricultural production costs by minimising the use of chemical pesticides, simplifying agronomic practices, improving productivity or by enhancing the value of crops. GE technology is gaining gradual acceptance wherever it has been introduced after adequate safety evaluation. Many people who do not have exposure to this technology have expressed fears about the use of transgenic plants produced by this technology. In order to dispel such fears, governments from different countries are conducting case-by-case evaluation of safety of transgenic plants before being released into the new open environment. In India, no transgenic plant has yet been commercially released, but testing for safety is in progress.

## Regulatory structure

India has a comprehensive legal and regulatory structure in place to deal with genetically modified organisms (GMOs). GMOs include GE seeds. This structure oversees the development of GMOs from research stage to large-scale commercial use. All GMO plants require evaluation in the open environment. Guidelines have been developed for field evaluation. Food safety issues are also addressed in the guidelines. There are detailed procedures for involving the State Governmnet authorities as well as the scientists from State and Central Government institutions. The regulations bring together the scientific personnel, the government officials as well as the legal system in the evaluation process. There is however no clear policy on labelling requirement of GMOs. Also, the capabilities to analyse and assess GMOs in products have not yet been developed.

There are several issues associated with GE technology in plants. Molecular biology provides capacities to isolate valuable genes and insert them into plants to produce new clones. Capacities to access risks and to conduct food and environmental safety evaluation are other parts of skills commensurate with this technology. Risk assessment includes analysing data on a case-by-case basis for informed decision. It covers deeper understanding of the behaviour of and interrelationships among transgenic plants, animals and micro-organisms, and implicating for environmental and/or food safety. In all GMOs, the three variables, namely the transgenic DNA sequences (genes, promoters, etc.), the transformed plants and the environment of release, need to be analysed through scientific experiments. As the flora and fauna as well as the environmental conditions vary from one place to another, the assessment of a transgenic plant in one environment may not be valid in another, necessitating fresh evaluation. Food immunology for allergenicity evaluation is not yet practised in India. The country has several institutions that intend to specialise in related disciplines in a fragmented manner. Consequently, there is need for a comprehensive approach to planning which includes upgradation of existing infrastructure and skills in most of the institutes. In addition, right relationships among the related institutes are also to be encouraged to enable them to broaden their horizon of activities through mutual cooperation.

In India bench scale researchers in top class laboratories spend close to $4,000 per person per year against $1,000-2,000 per person per year in most laboratories in the country. In contrast the expenditure in developed countries is close to $20,000 but about $30,000 or more per year in private foreign industries. These figures reflect the quantities of expensive materials the researchers have access to and are indicators of opportunities of development in different environment. The financial situation of Indian laboratories dealing with GE technology calls for a review.

Visibility of the technology in the public sector should be profound. Towards such efforts, the Indian Government can buy certain valuable transgenic DNA materials including transgenic seeds and establish collaboration with efficient international organisations, using the public sector institutions as the prime movers in order to develop GMOs of economic value. Several international organisations such as the International Rice Research Institute, Philippines, Rockefeller Foundation U.S., International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, have transgenic materials of economic value, whose assistance can be sought.

## Collaboration

There can also be great wisdom in identifying economically valuable Indian germplasms and use them as source materials for isolating and discovering DNA of economic value through collaboration. There can be various ways of achieving these objectives. One way can be that scientists from Indian public funded institutions could visit the premier research universities and institutions in developed countries, to convert the Indian materials into desired transgenic lines and bring the transformed materials back to India for use in agriculture. The intellectual properties developed through this process could be shared on mutually agreed terms, consistent with the IPR laws.

Over the last five years India has developed some expertise in scientific, managerial and legal skills to handle all aspects of GMOs. A large number of locally developed scientific protocols have been utilised to assess short-term risks of GMOs. India has gained experience through the conduct of several field experiments throughout the country, though there are yet gaps in assessing the environmental risks, both short-term as well as long-term ones. There is therefore a need to strengthen infrastructure, protocols and trained manpower in different agricultural universities.

For the acceptance of GMOs, the scientific assessment alone cannot be the ultimate basis for decision-making, howsoever precise the scientific study may be. Scientists derive experimental evidence by designing rational experiments and by taking measurements utilising techniques and instruments. All conclusions based on science have limitations in terms of methods used and the sensitivities of the instruments utilised. Moreover, the present knowledge in science would not provide a definite answer for certain questions. For example, the question of transfer of marker genes including antibiotic resistant genes from GE plants to microorganisms along with the effect of such transfer cannot be quantitatively resolved. Therefore, societies would have to decide on accepting or rejecting GMOs on the basis of current knowledge of assessment of risks. Once risks are ascertained with reasonable scientific certainty, decisions would have to be taken on the basis of other non-scientific considerations such as cost benefit analysis, the relevance of GMOs to societal needs in relation to addressing the problems of hunger or meeting the nutritional requirements.

● **Dr. P. K. GHOSH**

*Advisor, Ministry of Science & Technology, Dept. of Biotechnology*