



Promoters for Selective and Constitutive Expression in Genetically Modifiable Plants

Biotech Consortium India Limited (BCIL) is seeking companies interested in commercializing a technology for commercializing State-of-the-art promoters for expression in transgenic plants. Scientists at the Department of Plant Molecular Biology, University of Delhi have developed the present technology enabling expression of the transgenes in a constitutive as well as predictable/selectable manner.

BCIL was incorporated as public limited company in 1990 under the Indian Companies Act 1956. It is promoted by the Department of Biotechnology, Government of India and is financed by several all India financial institutions, venture capital funds and the corporate sector. BCIL has been actively involved in technology transfer, project consultancy, fund syndication, information dissemination, and manpower training & placement related to biotechnology over the last decade and half. BCIL has transferred more than 15 technologies in the last 5 years using its expertise in facilitating licensing agreements that allows a healthy and productive cooperation between the inventor and the licensee.

Introduction

Promoters are the regulatory elements which are essential to ensure stable expression of the transgenes. In present scenario, the promoters which are used for expressing transgenes in plants face a number of problems. Firstly, the number of promoters which can drive high levels of constitutive expression in both dicot and monocot plants are limited and there are just a handful of promoters driving tissue or organ specific expression. Secondly, the use of single promoter to drive the expression of two distinct heterologous genes in the same plant has been shown to lead to gene silencing. Thirdly, the IPR protection of the present promoters further forces the companies to share the royalties on the products developed using these promoters. Hence, there is an urgent need for identifying new promoters which can show strong constitutive and tissue and/or development specific expression for the transgenic expression in various plants without the problem of gene silencing. The present technology is a major breakthrough for addressing this need.

Technology

Scientists at University of Delhi, South campus, have successfully isolated and functionally characterized two promoters from rice tungro bacilliform virus (RTBV), capable of directing expression of operable linked nucleic acid sequences in both monocot and dicot plants, cells and tissues. The promoters which are the object of this technology include:



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1. **Promoter for selective expression:** State-of-the-art promoter which enables the expression of any gene in the sap-conducting vessels of the plant. Any gene of interest to be expressed in genetically modified plants such as rice, maize, tomato, cotton, cauliflower, mustard etc. can be made to express in a predictable manner using the promoter. These promoters can be used to express proteins that need to be expressed only in the non-edible parts of the plant e.g. insecticidal proteins.

2. **Promoter for Constitutive expression:** Enables strong expression of genes all throughout the plant.

Salient Features

1. The present promoters are active in both monocots and dicots.
2. Strong promoter for constitutive and selective expression as observed by the expression of bacterial reporter GUS gene in rice and tobacco plants, cells, tissues and organs.
3. Promoter with unique advantage of tissue specific expression.
4. Promoters successful in Gene Pyramiding: Enables expression of two genes at a time in transgenic plants without the risk of silencing of one of the genes.

Scale at which technology has been developed:

Production of genetically modified plants and testing of gene expression patterns controlled by the promoter in various plant parts has been successfully achieved using **100 different modified rice plants** at the University of Delhi. The technology has also been successfully tested on tobacco plants. The level of expression achieved with this promoter is at par with that of standard promoters used in the expression of foreign genes in genetically modified plants.

Patent & Publications

Use of promoter derived from rice tungro bacilliform virus (RTBV) for predictable gene expression in plants (**PCT Application No. PCT/IN2005/000285**). Patent applications for national phase in the following countries have also been filed – China, USA, United Arab Emirates, Europe Union, Japan and Vietnam.

Mathur, S and Dasgupta, I. (2007) Downstream promoter sequence of an Indian isolate of *Rice tungro bacilliform virus* alters tissue-specific expression in host rice and acts differentially in heterologous systems. *Plant Molecular Biology* 65(3):259-275. (The research paper can be provided by the BCIL upon request)



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Marketplace

The world population has reached 6 billion and is expected to increase at a much faster rate due to increasing worldwide average life expectancy. Cultivable land is limited and this has opened a huge market for genetically modified crops. The current food crisis suggests that there is an urgent need for developing new and improved GM crops. A number of plant varieties have already received the FDA approval for commercialization in the largest market of the world, the US. In the year 2007, global acreage for GM crops reached approximately 285 million acres witnessing a double digit growth for the 12th consecutive year. More than 85% of this land was cultivated by farmers in developing countries. Promoters currently being used for plants are already protected under patents held by companies based in North America or Europe making them expensive and difficult to access. The new promoter developed at University of Delhi offers an improved and a much cheaper alternative for developing new GM crops.

About the Inventor

Prof. Indranil Dasgupta, Department of Plant Molecular Biology, University of Delhi, South Campus, New Delhi, is the principal investigator and research coordinator in several research projects funded by Department of Biotechnology, Government of India. In the past, he has been the principal investigator of research projects funded by Department of Science and Technology, Government of India and the European Union. He has an international patent filed in countries, including China, European Union countries, Japan and India. Dr. Dasgupta has authored 28 publications in peer-reviewed high-impact national and international journals and has co-authored 7 chapters in different books, apart from participating in scientific conferences in UK, Canada, South Africa, Brazil and Philippines. He obtained his Ph.D. in the year 1987 and M.Sc. in the year 1980, both from Jawaharlal Nehru University, New Delhi.
