SOUTH ASIA
BIOSAFETY PROGRAM

January 2012
Vol.8 No.1

NEWSLETTER

for private circulation only - not for sale

www.cera-gmc.org

SABP

The South Asia Biosafety Program (SABP) is an international developmental program initiated with support from the United States Agency for International Development (USAID). The program is implemented in India and Bangladesh and aims to work with national governmental agencies to facilitate the implementation of transparent, efficient and responsive regulatory frameworks for products of modern biotechnology that meet national goals as regards the safety of novel foods and feeds and environmental protection.

SABP is working with its in-country partners to:

- Identify and respond to technical training needs for food, feed and environmental safety assessment.
- Develop a sustainable network of trained, authoritative local experts to communicate both the benefits and the concerns associated with new agricultural biotechnologies to farmers and other stakeholder groups.
- Raise the profile of biotechnology and biosafety on the policy agenda within India and Bangladesh and address policy issues within the overall context of economic development, international trade, environmental safety and sustainability.

PLANT TISSUE CULTURE AND BIOTECHNOLOGY CONFERENCE 2011

The Bangladesh Association for Plant Tissue Culture & Biotechnology (BAPTC&B) organized a plant tissue culture and biotechnology conference in January 6 and 7, 2012 at the Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna, Bangladesh. South Asia Bosafety Program (SABP) was one of the sponsors. About 150 biotechnologists from universities, National Agricultural Research System (NARS) institutes and biotechnology students attended.

Present at the conference's inaugural ceremony were several dignitaries, special guests and speakers including Dr. A.A.M.S. Arefin Siddique, Vice Chancellor, University of Dhaka; Dr. Wais Kabir, Executive Chairman, Bangladesh Agricultural Research Council (BARC); Mr. Md. Khairul Bashar, Director General, BSRI; Dr. M. Mozammel Haque, President, BAPTC&B; Dr. Sk. Shamimul Alam, General Secretary, BAPTC&B, and Dr. Md. Amzad Hossain, CSO and Head, Biotechnology Division, BSRI.

Some of the highlights of the inaugural ceremony were a welcome by Dr. Hossain, which included brief highlights of BAPTC&B activities and the conference's background; a speech by Mr. Bashar about the need to do biotechnology research to help solve pressing issues and to reduce the time required to produce improved crop varieties; Dr. Kabir's reminder of the vital role of biotechnology in keeping up with the agricultural challenges brought on by climate change and increasing population; Dr. Siddique's stressing of the need for proper facilities to induce scientific talent to stay in Bangladesh and the maintenance of scientific ties outside of Bangladesh in order to reap the benefits of new technology; Dr. Haque's description of BAPTC&B's humble beginnings in 1989 and the initiatives of its members to establish biotechnology laboratories at all the universities and NARS institutes in the public and private sectors; and Dr. Alam's expression of thanks to SABP and the University of Dhaka for their financial support and BSRI for hosting the conference.

(from left) Prof. Dr. Sk. Shamimul Alam, Mr. Md. Khairul Bashar, Dr. Wais Kabir, Prof. Dr. A.A.M.S. Arefin Siddique, Prof. Dr. M.M. Haque, and Dr. M.A. Hossain.

The conference consisted of four scientific sessions, including one plenary session with two presentations, the first by Dr. Hossain on the status of biotechnological research at BSRI and the second by Dr. R.H. Sarker of the University of Dhaka's Department of Botany on the Bangladesh perspective on the opportunities and challenges of agricultural biotechnology. Other scientific sessions included one by Deputy Director, Department of Environment and Member Secretary, National Committee on Biosafety and Biosafety Core Committee, Mr. M.S. Haider's presentation on the development of biosafety regimes of Bangladesh; SABP Country Coordinator, Dr. M. Imdadul Hoque's overview on the status of agricultural biotechnology and SABP activities in Bangladesh; and a presentation by Dr. Nazia Mintz-Habib of the Centre for International Development, Kennedy School of Government, Harvard University, who spoke about agro-biotechnology and food security as an international economics project. Approximately 20 research papers covering various aspects of plant tissue culture and genetic transformations were also presented. The conference concluded with the annual general meeting of BAPTC&B on January 7, 2012.

REGULATING GENETICALLY ENGINEERED INSECTS: ISSUES AND CHALLENGES

Dr. K.K. Tripathi, Advisor, Department of Biotechnology, Ministry of Science and Technology, Government of India

Genetically engineered (GE) insects are produced by inserting new genes into their DNA. Many genes have been identified that can alter the behavior and biology of insects and efforts are underway to insert them into insect genome to develop GE insects. In fact, novel techniques to manipulate genes over the last few years have allowed many insects to be genetically engineered including agricultural pests such as the Mediterranean fruit fly, disease vectors such as mosquitoes and economic insects such as silk moth. There

(continued on page 2 - see Insects)

INSECTS - *continued from page 2*

are four main application strategies for GE insects that are currently being developed or envisaged. These include:

i. Modifications to the production of useful products or higher increased production rates thereof.

ii. Modifications that incapacitate the insect from transmitting diseases and the passing on of such traits to target populations, essentially rendering the vector population benign.

iii. Integration of GE-approaches into classically sterile insect technique programmes

iv. Transformation of beneficial arthropods for bio-control purposes.

The first GE insect released into the environment was the cotton pest GE pink bollworm moth. It took place in the United States and was the first use of GE insects in a plant pest control programme. Research is underway on about 30 insect species in various countries as indicated in the recent report "Defining Environmental Risk Assessment Criteria for Genetically Modified Insects to be placed on the EU Market", which was submitted in 2010 to the European Food Safety Authority (Table 1). This report provides an overview of the genetic modifications, the transformation systems, the intended use and the current status of development. In addition, a short description for each of the species is given in order to provide some background information about its importance and control measures (conventional as well as transgenic).

Whereas on the one hand several unique benefits of GE insects have been proposed, in parallel, concerns have been raised about their release indicating that there could be unintended and wide ranging impacts on the environment and human health due to the complexity of the ecosystem.

Lucilia cuprina (Green bottle fly; Calliphoridae)

Existing legislation in India as well as in other countries has been designed to regulate all genetically engineered organisms, but its implementation has so far focussed on the regulations of GE crops. There is an urgent need for appropriate guidance on the application of these regulations to GE insects so as to ensure that technologies are developed taking into consideration safety issues. At the international level efforts to develop guidelines for development and release of GE insects have been made. The North American Plant Protection Organisation has already drafted guidance on the release of GE insects in its member nations. The World Health Organization's Special Programme for Research and Training in Tropical Diseases, in collaboration with the US Foundation for the National Institutes of Health, is developing guidance on the "safety, efficacy, regulation and ethical, social and cultural issues" surrounding the release of GM mosquitoes. The European Food Safety Authority is in the process of developing guidelines for the environmental risk assessment of GE insects for commercial use in the EU.

Taking into consideration global and Indian developments, the Department of Biotechnology, Government of India has also initiated the process to develop appropriate guidance for GE insects through the involvement of subject experts. The issues to be addressed include development of a stepwise regulatory pathway, data requirements for safety assessment, guidance for conduct of various types of trials, etc.

TABLE 1

GE INSECTS UNDER RESEARCH AND DEVELOPMENT

Coleoptera

Tribolium castaneum (Red flour beetle)

Diptera (Culicidae)

Aedes aegypti (Yellow fever mosquito)
Aedes albopictus (Asian tiger mosquito)
Aedes fluviatilis
Anopheles albimanus (New world malaria mosquito)
Anopheles arabiensis
Anopheles gambiae s.s. (African malaria mosquito)
Anopheles stephensi (Indo-Pakistan malaria mosquito)
Culex quinquefasciatus (Southern house mosquito)

Diptera (Tephritidae)

Anastrepha ludens (Mexican fruit fly)
Anastrepha suspensa (Caribbean fruit fly)
Bactrocera dorsalis (Oriental fruit fly)
Bactrocera oleae (Olive fruit fly)
Bactrocera tryoni (Queensland fruit fly)
Ceratitis capitata (Mediterranean fruit fly)

Diptera (other)

Cochliomyia hominivorax (New world screwworm; Calliphoridae)
Drosophila spp. (Fruit flies; Drosophilidae)
Lucilia cuprina (Green bottle fly; Calliphoridae)
Musca domestica (House fly; Muscidae)
Stomoxys calcitrans (Stable fly; Muscida)

Hymenoptera

Apis mellifera (Honey bee)
Athalia rosae (Turnip sawfly)

Lepidoptera

Bicyclus anynana (Squinting bush brown)
Bombyx mori (Silk moth)
Cydia pomonella (Codling moth)
Pectinophora gossypiella (Cotton pink bollworm)

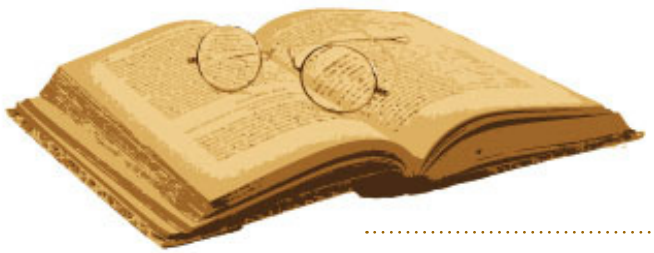
Acari

Metaseiulus occidentalis (Western predatory mite)

Crustacea

Parhyale hawaiensis
Procambarus clarkii (North American crayfish)

Source: http://www.efsa.europa.eu/en/supporting/doc/71e.pdf



The Reading List

. . . new and notable articles

MINIMIZING THE UNPREDICTABILITY OF TRANSGENE EXPRESSION IN PLANTS: THE ROLE OF GENETIC INSULATORS

Singer SD, Liu Z, Cox KD

The genetic transformation of plants has become a necessary tool for fundamental plant biology research, as well as the generation of engineered plants exhibiting improved agronomic and industrial traits. However, this technology is significantly hindered by the fact that transgene expression is often highly variable amongst independent transgenic lines. Two of the major contributing factors to this type of inconsistency are inappropriate enhancer-promoter interactions and chromosomal position effects, which frequently result in mis-expression or silencing of the transgene, respectively. Since the precise, often tissue-specific, expression of the transgene(s) of interest is often a necessity for the successful generation of transgenic plants, these undesirable side effects have the potential to pose a major challenge for the genetic engineering of these organisms. In this review, we discuss strategies for improving foreign gene expression in plants via the inclusion of enhancer-blocking insulators, which function to impede enhancer-promoter communication, and barrier insulators, which block the spread of heterochromatin, in transgenic constructs. While a complete understanding of these elements remains elusive, recent studies regarding their use in genetically engineered plants indicate that they hold great promise for the improvement of transgene expression, and thus the future of plant biotechnology.

PLANT CELL REPORTS. (2011). [EPUB AHEAD OF PRINT]

CAPITALIZING ON DELIBERATE, ACCIDENTAL, AND GM-DRIVEN ENVIRONMENTAL CHANGE CAUSED BY CROP MODIFICATION

Knox OG, Walker RL, Booth EJ, Hall C, Crossan AN, Gupta VV

The transgenic traits associated with the majority of commercial genetically modified crops are focused on improving herbicide and insecticide management practices. The use of the transgenic technology in these crops and the associated chemistry has been the basis of studies that provide evidence for occasional improvement in environmental benefits due to the use of less residual herbicides, more targeted pesticides, and reduced field traffic. This is nicely exemplified through studies using Environmental Impact Quotient (EIQ) assessments. Whilst EIQ evaluations may sometimes illustrate environmental benefits they have their limitations. EIQ evaluations are not a surrogate for Environmental Risk Assessments and may not reflect real environmental interactions between crops and the environment. Addressing the impact cultivated plants have on the environment generally attracts little public attention and research funding, but the introduction of GM has facilitated an expansion of research to address potential environmental concerns from government, NGOs, industry, consumers, and growers. In this commentary, some evidence from our own research and several key papers that highlight EIQ assessments of the impact crops are having on the environment are presented. This information may be useful as an education tool on the potential benefits of GM and conventional farming. In addition, other deliberate, accidental, and GM-driven benefits derived from the examination of GM cropping systems is briefly discussed.

JOURNAL OF EXPERIMENTAL BOTANY. (2011) NOV 16. [EPUB AHEAD OF PRINT]

GENE FLOW IN GENETICALLY MODIFIED WHEAT.

Rieben S, Kalinina O, Schmid B, Zeller SL

Understanding gene flow in genetically modified (GM) crops is critical to answering questions regarding risk-assessment and the coexistence of GM and non-GM crops. In two field experiments, we tested whether rates of cross-pollination differed between GM and non-GM lines of the predominantly self-pollinating wheat *Triticum aestivum*. In the first experiment, outcrossing was studied within the field by planting "phytometers" of one line into stands of another line. In the second experiment, outcrossing was studied over distances of 0.5-2.5 m from a central patch of pollen donors to adjacent patches of pollen recipients. Cross-pollination and outcrossing was detected when offspring of a pollen recipient without a particular transgene contained this transgene in heterozygous condition. The GM lines had been produced from the varieties Bobwhite or Frisal and contained *Pm3b* or *chitinase/glucanase* transgenes, respectively, in homozygous condition. These transgenes increase plant resistance against pathogenic fungi. Although the overall outcrossing rate in the first experiment was only 3.4%, Bobwhite GM lines containing the *Pm3b* transgene were six times more likely than non-GM control lines to produce outcrossed offspring. There was additional variation in outcrossing rate among the four GM-lines, presumably due to the different transgene insertion events. Among the pollen donors, the Frisal GM line expressing a *chitinase* transgene caused more outcrossing than the GM line expressing both a *chitinase* and a *glucanase* transgene. In the second experiment, outcrossing after cross-pollination declined from 0.7-0.03% over the test distances of 0.5-2.5 m. Our results suggest that pollen-mediated gene flow between GM and non-GM wheat might only be a concern if it occurs within fields, e.g. due to seed contamination. Methodologically our study demonstrates that outcrossing rates between transgenic and other lines within crops can be assessed using a phytometer approach and that gene-flow distances can be efficiently estimated with population-level PCR analyses.

PLOS ONE. 2011;6(12):E29730. EPUB 2011 DEC 27.

CALENDAR OF EVENTS

Event	Organized by	Date and Venue	Website
INDIA			
Seminar on Biotechnology in Indian Agriculture: Performance, Potential and Concerns	Centre for Economic and Social Studies (CESS) in collaboration with International Food Policy Research Institute, Washington DC and Department of Agriculture, Government of Andhra Pradesh	January 18-19, 2012 Hyderabad	
8th International Safflower Conference Safflower Research and Development in the World: Status and Strategies	Indian Society of Oilseeds Research and Indian Council of Agricultural Research	January 19 - 23, 2012 Hyderabad	http://www.dor-icar.org.in/downloads/Conference1.pdf
Indian Seed Congress 2012	National Seed Association of India	February 10 - 11, 2012 Pune	http://www.indianseedcongress.com/default.htm
Second International Conference on Agrochemicals Protecting Crops, Health and Natural Environment: Role of Chemistry for Sustainable Agriculture	Indian Agricultural Research Institute, The Society for the Promotion of Sustainable Agriculture, Indian Council of Agricultural Research	February 15 - 18, 2012 New Delhi	http://www.iari.res.in/
International Conference on Plant Biotechnology for Food Security: New Frontiers	Society for Plant Biochemistry and Biotechnology, National Research Centre on Plant Biotechnology	February 21 - 24, 2012 New Delhi	http://www.spbbindia.org/
Seed Industry Program 2012	Cornell University, College of Agriculture and Life Sciences Manager - Center For Executive Education Sathguru Management Consultants	March 5 - 8, 2012 Goa	http://www.nsai.co.in/Events/upload/brochure.pdf
National Seminar on New Frontiers and Future Challenges in Horticultural Crops	College of Agriculture, PAU, Ludhiana Sponsored by National Horticulture Mission	March 6 - 8, 2012 Ludhiana	http://web.pau.edu/coa/content/userfiles/10.pdf
International Symposium on New Paradigms in Sugarcane Research	Society for Sugarcane Research and Development and Sugarcane Breeding Institute	October 15-18, 2012 Coimbatore	http://www.sugarcane.res.in/images/sbi/Centenary/1st_circular_int_symposium.pdf
Biosafety Workshop on Problem Formulation: A Strategic Approach to Risk Assessment of GMOs	International Centre for Genetic Engineering and Biotechnology (ICGEB) in collaboration with the Ministry for Environment, for the Protection of the Territory and for the Sea, Government of Italy	April 16 - 20, 2012 Trieste Italy	http://www.icgeb.org/tl_files/Meetings/2012/ICGEB%20TS%20BSF%2016-20%20April%202012.pdf
Workshop on Biosafety of Genetically Engineered Crops: Best Practices from Laboratory to Farmer's Fields	ICGEB in collaboration with GENETECH, Colombo, Sri Lanka, University of Colombo, Sri Lanka, Michigan State University, USA, The National Science Foundation, Colombo, Sri Lanka and Embassy of USA, Colombo, Sri Lanka	May 21 - 25, 2012 Colombo, Sri Lanka	http://www.icgeb.org/meetings-2012.html
12th International Symposium on Biosafety of Genetically Modified Organisms (ISBGMO12)	International Society for Biosafety Research	September 17 – 20, 2012 St Louis, Missouri, USA	http://www.isbgmo.com/

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