SOUTH ASIA
BIOSAFETY PROGRAM

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NEWSLETTER

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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.

BANGLADESH "GUIDELINES FOR SAFETY ASSESSMENT OF FOODS DERIVED FROM GE PLANTS" POSTED

The Bangladesh National Committee on Biosafety (NCB) has approved in principle the draft "Guidelines for the Safety Assessment of Foods Derived from Genetically Engineered Plant" developed by Bangladesh Agricultural Research Council (BARC) with technical assistance from South Asia Biosafety Programme (SABP).

The draft guidelines will be posted for one month on the Department of Environment (DOE) website for public comments. After incorporating the relevant comments/ suggestions the Guidelines will be gazetted as an annexure of the Biosafety Guidelines of Bangladesh.

Please visit the DOE website (http://www.doe-bd.org/Food_Safetly_guidelines.html) for details and to post your comments/suggestions.

ORIENTATION TRAINING GIVEN FOR CONTAINED FIELD TRIALS OF BT BRINJAL AND LBR POTATO IN BANGLADESH

The Bangladesh National Committee of Biosafety (NCB) recently approved confined field trials of Bt brinjal in seven locations and Late Blight Resistant (LBR) potato in two locations. Confined field trials of Bt brinjal will be performed at BARI headquarters at Joydebpur and BARI Agricultural Research Stations (ARS) at Jessore, Hathhazari, Rahmatpur, Jamalpur, Bururhat and Ishurdi. Confined field trials of LBR potato will be done at the BARI headquarters at Joydebpur and at the BARI regional station Burirhat.

In the last growing season BARI performed confined field trials of Bt brinjal at its headquarters at Joydebpur and at the ARSs at Jessore and Hathhazari. The LBR potato confined field trials were performed at the headquarters at Joydebpur and the ARS at Debiganj. South Asia Biosafety Program (SABP) assisted BARI and the Department of Environment to train the field trial managerial group and the Field Level Biosafety Committee members to run the first trials.

BARI held an orientation training course for its scientists who will be involved in this year's confined field trials because of the added trial locations. The event was held at the BARI headquarters at Joydebpur, Gaizpur on December 9 and 10, 2009. Sixty scientists from the different research stations attended.

(from left) Dr. Md. Khalequzzaman A. Chowdhury, Dr. Md. Abdul Haque, Ms Wahida Sultana and Dr. Md. Ehsanul Haque

The course was inaugurated by Dr. M. Khalequzzaman A. Chowdhury, Member Director (Crops), Bangladesh Agricultural Research Council (BARC). Joining him were Dr. Md. Abdul Haque, Director, Horticulture Research Centre (HRC); Dr. Md. Ehsanul Haque, Director, Tuber Crops Research Centre (TRC) and Ms Wahida Sultanta, Director (Training & Support Service).

Dr. Md. Al-Amin, Head, Biotechnology Division, BARI and the Course Coordinator welcomed the guests and participants of the training course. He also highlighted the objectives and background of the training course.

The training course included the following training sessions:

- **Dr. Khalequzzaman A. Chowdhury:** The importance of GM Crops and Food Security in Bangladesh, which described the challenges and opportunities of agricultural biotechnology in fulfilling the demands of

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CALENDAR OF EVENTS

Event	Organized by	Date and Venue		Website
INDIA				
Series of National Consultations on Bt Brinjal	Ministry of Environment and Forests and Centre for Environment Education	Kolkata	January 13, 2010	http://www.ceeindia.org/cee/bt_brinjal.html
		Bhubaneswar	January 16, 2010	
		Ahmedabad	January 19, 2010	
		Hyderabad	January 22, 2010	
		Bangalore	January 23, 2010	
		Nagpur	January 27, 2010	
		Chandigarh	January 30, 2010	
Indian People's Tribunal (IPT) on the issue of Genetically Modified (GM) seeds/foods and Bt Brinjal in particular	Human Rights Law Network	January 28, 2010 New Delhi		
Indian Seed Congress 2010	National Seed Association of India	February 12 - 13, 2010 Bangalore		http://www.indianseed-congress.com/
National Symposium on "Genomics and Crop Improvement: Relevance and Reservations"	Acharya N.G. Ranga Agricultural University, Department of Biotechnology and Indian Council of Agricultural Research	February 25 - 27, 2010 Hyderabad		http://www.angrau.net/Documents/Symposium_fina.pdf
A practical training course on Techniques in Plant Tissue Culture, Genetic Engineering and Molecular Biology	CCS Haryana Agricultural University, Hisar, Haryana	May 12 – June 23, 2010 Hisar		http://hau.ernet.in/cobs/bmbtraining3_2010.pdf
INTERNATIONAL				
2010 International Symposium on Cancer and Developmental Biology: Latest Biochemical Advances	Bangladesh Society for Biochemistry and Molecular Biology	January 29 – 31, 2010 Nabab Nawab Ali Chowdhury Senate Bhavan, University of Dhaka		http://www.bdsbmb.org
BioAsia 2010	Federation of Asian Biotech Associations	February 3 - 6, 2010 Hyderabad		http://www.bioasia.in/
2010 International Conference on Biotechnology and Food Science (ICBFS 2010)	Food and Agricultural Society	February 9 - 10, 2010 Bangalore		http://www.iacsit.org/icbfs/index.htm
Biotech World 2010	Department of Biotechnology, Faculty of Sciences of the University of Oran, Sénia	April 26 - 29, 2010 Oran, Algeria		http://biotex-eng.webnode.com/

DBT INDIA PUBLISHES SERIES OF CROP SPECIFIC BIOLOGY DOCUMENTS

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

Safety assessment of genetically engineered (GE) crops is extremely important in their development process in view of various concerns for human and animal health and environment. Therefore, extensive evaluation and regulatory approval process takes place before any GE crop is introduced for cultivation. This includes generation and documentation of relevant information/data and its comprehensive and elaborate analysis.

Several GM crops are under development and field trials in India. The approval for conducting various field trials is given by Department of Biotechnology (DBT) and Ministry of Environment & Forests (MoEF) through Review Committee on Genetic Manipulation (RCGM) and Genetic Engineering Approval Committee (GEAC) under Rule 1989 of the Environment (Protection) Act, 1986. In order to streamline the conduct of field trials of GM crops by product developers and to strengthen the monitoring mechanisms, "Guidelines and Standard Operating Procedures (SOPs) for Confined Field Trials of Regulated, Genetically Engineered Plants, 2008". Continuing with the initiatives to strengthen the assessment process, efforts have been initiated to provide brief information on biology of various crops being subjected to genetic modification in India.

Environmental safety analysis of a GE crop is in particular based on the characteristics of the organism, the introduced trait, the environment into which the organism is introduced, the interaction between these, and the intended application. Accordingly most environmental safety assessments of GE plants are based upon a broad body of knowledge and experience with the crop plant. This familiarity with the crops allows both the developers and regulators to draw on previous knowledge and experience to ensure safety of the GE crops.

A "Series of Crop Specific Biology Documents" for use of as reference in evaluation GE crops in India has been prepared. The objective of these documents is to make available the information about biology of the crops to applicants as information in applications to regulatory authorities; to regulators as a guide and

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The Reading List

. . . new and notable articles

BARRIERS AND PATHS TO MARKET FOR GENETICALLY ENGINEERED CROPS

C.M. Rommens

Each year, billions of dollars are invested in efforts to improve crops through genetic engineering (GE). These activities have resulted in a surge of publications and patents on technologies and genes: a momentum in basic research that, unfortunately, is not sustained throughout the subsequent phases of product development. After more than two decades of intensive research, the market for transgenic crops is still dominated by applications of just a handful of methods and genes. This discrepancy between research and development reflects difficulties in understanding and overcoming seven main barriers-to-entry: (1) trait efficacy in the field, (2) critical product concepts, (3) freedom-to-operate, (4) industry support, (5) identity preservation and stewardship, (6) regulatory approval and (7) retail and consumer acceptance. In this review, I describe the various roadblocks to market for transgenic crops and also discuss methods and approaches on how to overcome these, especially in the United States.

Plant Biotechnology Journal - Early View, November 2009 (DOI10.1111/j.1467-7652.2009.00464.x)

INDUCING DROUGHT TOLERANCE IN PLANTS: RECENT ADVANCES

M. Ashraf

Undoubtedly, drought is one of the prime abiotic stresses in the world. Crop yield losses due to drought stress are considerable. Although a variety of approaches have been used to alleviate the problem of drought, plant breeding, either conventional breeding or genetic engineering, seems to be an efficient and economic means of tailoring crops to enable them to grow successfully in drought-prone environments. During the last century, although plant breeders have made ample progress through conventional breeding in developing drought tolerant lines/cultivars of some selected crops, the approach is, in fact, highly time-consuming and labor- and cost-intensive. Alternatively, marker-assisted breeding (MAB) is a more efficient approach, which identifies the usefulness of thousands of genomic regions of a crop under stress conditions, which was, in reality, previously not possible. Quantitative trait loci (QTL) for drought tolerance have been identified for a variety of traits in different crops. With the development of comprehensive molecular linkage maps, marker-assisted selection procedures have led to pyramiding desirable traits to achieve improvements in crop drought tolerance. However, the accuracy and preciseness in QTL identification are problematic. Furthermore, significant genetic × environment interaction, large number of genes encoding yield, and use of wrong mapping populations, have all harmed programs involved in mapping of QTL for high growth and yield under water limited conditions. Under such circumstances, a transgenic approach to the problem seems more convincing and practicable, and it is being pursued vigorously to improve qualitative and quantitative traits including tolerance to biotic and abiotic stresses in different crops. Rapid advance in knowledge on genomics and proteomics will certainly be beneficial to fine-tune the molecular breeding and transformation approaches so as to achieve a significant progress in crop improvement in future. Knowledge of gene regulation and signal transduction to generate drought tolerant crop cultivars/lines has been discussed in the present review. In addition, the advantages and disadvantages as well as future prospects of each breeding approach have also been discussed.

Biotechnology Advances 28 (1): 169-183

GENERATION OF "BACKBONE" FREE, LOW TRANSGENE COPY PLANTS BY LAUNCHING T-DNA FROM THE *AGROBACTERIUM* CHROMOSOME

H. Oltmanns, B. Frame, L.Y. Lee, S. Johnson, B. Li, K. Wang, S.B. Gelvin

In both applied and basic research, *Agrobacterium*-mediated transformation is commonly used to introduce genes into plants. We investigated the effect of three *Agrobacterium tumefaciens* strains and five T-DNA origins of replication on transformation frequency, transgene copy number, and the frequency of integration of non-T-DNA portions of the T-DNA-containing vector ("backbone") into the genome of *Arabidopsis thaliana* and *Zea mays*. Launching T-DNA from the picA locus of the *Agrobacterium* chromosome increases the frequency of single transgene integration events and almost eliminates the presence of vector backbone sequences in transgenic plants. Along with novel *Agrobacterium* strains we have developed, our findings are useful for improving the quality of T-DNA integration events.

Plant Physiology 2009 Dec 18. [Epub ahead of print]

THE HUMANITARIAN IMPACT OF PLANT BIOTECHNOLOGY: RECENT BREAKTHROUGHS *VS* BOTTLENECKS FOR ADOPTION

G. Farre , K. Ramessar, R.M. Twyman, T. Capell , P. Christou

The deployment of genetically engineered (GE) crops in developing countries is regarded by some as a sinister manifestation of 'big business' in science. What is often overlooked, and sometimes even deliberately ignored by opponents of the technology, is that many researchers working in the field are not motivated by profits but by a desire to see such crops applied to humanitarian purposes. GE crops could help to address many of the world's most challenging, interrelated problems, including hunger, malnutrition, disease, and poverty. However, this potential will not be realized if the major barriers to adoption - which are political rather than technical - are not overcome.

Current Opinion in Plant Biology 2009 Dec 16. [Epub ahead of print]

DEFENSIN PROMOTERS AS POTENTIAL TOOLS FOR ENGINEERING DISEASE RESISTANCE IN CEREAL GRAINS

N. Kovalchuk, M. Li, F. Wittek, N. Reid, R. Singh, N. Shirley, A. Ismagul, S. Eliby, A. Johnson, A.S. Milligan, M. Hrmova, P. Langridge and S. Lopato

Engineering of plant protection in cereals requires well characterized tissue-specific and wounding/pathogen-inducible promoters for targeted expression of pathogen responsive

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Bangladesh - *continued from page 1*

the country. It included the global status of biotech crops and their usefulness.

- **Dr. G.P. Das,** Country Coordinator, ABSP II: An overview of the objectives and achievements of the ABSP II programme in Bangladesh and India.
- **Mr. M. Solaiman Haider,** Deputy Director (Technical), Department of Environment (DoE) and Member Secretary, National Committee on Biosafety (NCB): A description of the Biosafety Guidelines of Bangladesh and National Biosafety Framework of Bangladesh, a review of the obligations of Bangladesh under international treaties and conventions such as Convention on Biological Diversity, a description of the importance of proper scientifically designed trials of genetically engineered plants and a suggestion to trial managers and scientists involved in the confined field trials of Bt brinjal and LBR potato to perform the trials accurately following the Biosafety Guidelines and Standard Operating Procedures (SOPs) and to record all results and data in the prescribed format approved by the NCB.
- P**rof. M. Imdadul Hoque,** Country Coordinator, SABP: Risk Assessment Approach to Confined Field Trials of Genetically Engineered Plants, which explained the differences between contained, confined and open field trials of GE plant, the purpose of the confined field trials and the steps involved in them, the role of "3Ps" towards risk mitigation for confined field trials and an introduction on following SOPs and how to record data during transport, storage, current season, harvest, post-harvest monitoring, and a discussion on how to maintain reproductive isolation during field trials.
- **Dr. Md. Al-Amin,** Head, Biotechnology Division of BARI: An overview of research activities of BARI including the developmental history of GM crops, present status and future strategies of genetically engineered crops at BARI.
- **Dr. Syed Nurul Alam,** Principal Scientific Officer, Entomology Division of BARI: Presented a paper entitled "*Bacillus thuringiensis*: its mode of action and effectiveness on Lepidopteran insects".
- **Dr. Kamal Humayun Kabir,** Chief Scientific Officer, Entomology Division of BARI: A presention on the collection and analysis of entomological data collected during the first field trials of Bt brinjal.
- **Dr. Rustam Ali,** Principal Scientific Officer, Pathology Division of BARI: A presentation on the collection and analysis of pathological data collected during the first field trials of Bt brinjal.
- **Dr. Delowara Khanam,** Principal Scientific Officer, Soil Microbiology, Soil Science Division of BARI: A description of the methods of data collection of soil micro-flora during the confined field trials of Bt brinjal and LBR potato.
- **Dr. Tapon Kumar Dey,** Principal Scientific Officer, Tuber Crops Research Centre of BARI: A presentation on the collection and analysis of pathological data collected during the first field trials of LBR potato.

Biology - *continued from page 2*

reference source in their regulatory reviews; and for information sharing, research reference and public information. To start, crop specific documents for cotton, brinjal, maize, okra and rice have been prepared. In addition to the scientific literature and references, the documents have also taken into account the information available in Consensus documents published by OECD as well as biology documents by other countries. The documents have been finalized through a consultative process with the concerned research institutions, state agricultural universities and subject experts. The documents had also been placed on the DBT's biosafety websites for public review.

The intent of the biology documents is to provide information directly relevant to safety assessment in a readily accessible format. These documents also give an overview of pertinent biological information on the crop species to help define the baseline and scope (the comparator against which GE crop will be compared), in the safety assessment process.

Reading List - *continued from page 3*

and resistance genes. We describe the isolation of seven wheat and rice defensin genes expressed in early developing grain and during grain germination, two developmental stages that are particularly vulnerable to pathogens and insects. Comparison of three-dimensional (3D) models of these rice and wheat PRPI defensins indicated variations in spatial architectures that could reflect their functional diversities. Wheat and rice were stably transformed with promoter–GUS fusion constructs and the spatial and temporal activities of four promoters were studied using whole-mount and histological assays. *PRPI* promoters were active before and at anthesis in both transgenic wheat and rice with activity mainly in the ovary. In rice, GUS activity was also observed in vascular tissue of the lemma, palea and anthers. After fertilization, GUS was strongly expressed in the outer cell layers of the pericarp and in the main vascular bundle of the grain. During, and a short time after, seed germination, wheat promoters were active in transgenic rice embryos, roots and/or coleoptiles. All wheat and rice promoters were strongly induced by wounding in leaf, stem and grain of transgenic rice plants. These results suggest that *PRPI* promoters will be useful for specific targeting and accumulation of proteins conferring resistance to pathogens in vulnerable tissues of developing and germinating grain.

Plant Biotechnology Journal 8(1): 47 – 64

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