



SOUTH ASIA
BIOSAFETY PROGRAM

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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.

ISOLATION DISTANCE IN CONFINED FIELD TRIALS OF GE CROPS

Dr. O.P. Govila, Former Professor of Genetics, Division of Genetics, Indian Agricultural Research Institute, New Delhi

Isolation distance is one of the frequently used methods for the purpose of isolating crop plants for maintaining pure lines for seed production. It is generally prescribed as the minimum separation required between two or more varieties of the same species for the purpose of keeping seed pure. Species in the same genus or family often have similar minimum isolation distance requirements, but occasionally certain varieties within a species may require larger isolation distances. In addition, many environmental factors and pollen morphology can affect how far and how effectively pollen can be transferred by wind or by insects. The requirement of isolation distance varies for different classes of seeds such as "breeder's seed", "foundation seed" and "certified seed". The principles and practices of using isolation distances in seed crop production have been well researched.

Maintaining specific isolation distance is extremely important during the conduct of field trials of new plant varieties, whether these are produced by conventional breeding methods or through modern genetic engineering techniques. Whereas exposing new lines or plants with new traits to the natural environment in the field is essential to research, development, characterization, and eventual release of new varieties for use by farmers, it is also important to keep lines containing new genes/traits on the trial site by controlling

pollen-mediated gene flow and maintain control of the plant material during the conduct of field trials.

Minimum isolation distance requirements for a particular species depend on several factors such as whether it is self-pollinated or cross-pollinated, extent of outcrossing, pollen morphology and physiology, types of pollinators and the environment in which the crops are grown. For example, a number of self-pollinated crops require little or no isolation to produce genetically pure seeds. On the other hand, some of the cross-pollinated species with wind-pollination or insect-pollination taking place frequently, require large isolation distances. In cases where it is difficult to maintain such large requirements, alternative strategies such use of barrier crops or different flowering times are also used to decrease the distance. Barrier crops serve several functions such as providing the physical barrier for pollinators and in some cases distracting pollinators by providing alternative pollen and nectar sources. Ideally, a barrier crop is taller than the seed crop or is dense and produces abundant flowers during the cross-pollination. In India, the minimum isolation distance requirement for the field trials of genetically engineered (GE) crops are based on the "Indian Minimum Seed Certification Standards" prescribed by The Central Seed Certification Board. The Minimum Seed Certification Standards were first published as a manual in 1971. This manual contained general seed certification standards applicable to all crops and specific seed certification standards applicable to 56 crops. Subsequently, the revised version was released in 1988 taking into consideration the research in seed technology and information suited to Indian conditions. The updates to the above manual have also been released. Seed Certification Agencies of all the states in India follow these standards to maintain the genetic purity of seeds of conventional crop varieties.

It may also be noted that these requirements are not static and the regulatory agencies take into consideration specific factors and recommend appropriate isolation distance as well as other strategies to restrict the gene flow during the conduct of experimental trials of various GE crops.

DISCUSSION MEETING ON STATUS OF BANGLADESH BIOSAFETY ACTIVITIES HELD AT DOE

A discussion meeting on the status of the Bangladesh biosafety regulatory regime was held at the Department of Environment (DOE), Agargaon, Dhaka on October 4, 2010. The meeting was presided over by Mr. Md. Shahjahan, Director (Environmental Management), DOE. Other attendees included Mr. Mark Visocky, Deputy Office Director, USAID, Dhaka; Dr. Shahidur Rahman Bhuiyan, Economic Growth Office, USAID, Dhaka; Dr. Saharah Moon Chapotin, Biotechnology Adviser, USAID, Washington, D.C.; Dr. Andrew Roberts, Deputy Director, Center for Environmental Risk Assessment (CERA), Washington, D.C.; and Dr. M. Khalequzzaman A. Chowdhury, Member Director (Crops), BARC. Also present and representing the Biosafety Core Committee (BCC) were Prof. Dr. Naiyyum Chowdhury; Prof.

(continued on page 2 - see Bangladesh)



DESIGNING GOOD NON-TARGET ORGANISM STUDIES

CERA (South Asia Biosafety Program partner) and the GMO Working Group of the West Palaearctic Regional Section of the International Organisation for Biological Control (IOBC/WPRS) are co-organising a workshop "Design Considerations for Laboratory Studies on Non-Target Arthropods for Risk Assessment of GM Plants". The workshop will be held November 19, 2010 in conjunction with the International Symposium on the Biosafety of Genetically Modified Organisms in Buenos Aires, Argentina. This workshop will provide a platform to discuss key design considerations that are important for the reproducibility and interpretability of early tier, non-target arthropod laboratory studies used in risk assessment of genetically modified plants. Points to consider when designing and executing a laboratory non-target study will be presented and then exemplified using practical case studies from public and private sector institutions.

The workshop agenda can be downloaded from <http://cera-gmc.org/index.php?action=news&id=7>.



Center for
Environmental
Risk Assessment



IOBC-WPRS
OILB-SROP

BANGLADESH - continued from page 2

Dr. Bahadur Meah; Prof. Dr. Zeba Islam Seraj; and Prof. Dr. M. Imdadul Hoque, Country Coordinator, SABP. Mr. Muhammad Solaiman Haider, Deputy Director, DOE and Member Secretary, National Committee on Biosafety (NCB) and BCC facilitated the discussion meeting.

Mr. Haider welcomed the participants and gave a brief account of the development of the biosafety regulatory regimes in Bangladesh. He reported the Ministry of Environment and Forests has developed and gazetted the Biosafety Guidelines of Bangladesh, National Biosafety Framework (NBF) of Bangladesh. He acknowledged that, through the assistance of SABP and BARC, DOE developed the confined field trial guidelines of GE plants; inspector manual for confined field trials of GE plants; crop-wise standard operating procedures (SOPs); data recording formats for confined field trial guidelines of GE plants; and biology documents for eggplant. The guidelines for the safety assessment of foods derived from GE plants has also been approved by the NCB. He also said the Biosafety Rules of Bangladesh have been drafted and approved through the inter-ministerial meeting and will now be sent to the Ministry of Law for vetting with the hope that they will be gazetted by the MOEF in the shortest possible time.

Mr. Haider also briefly described the progress on the confined field trials of Bt eggplant and late blight resistant potato being conducted at Bangladesh Agricultural Research Institute (BARI) under the ABSPII project.

Participants engaged in a discussion after the introductory remarks of Mr. Haider. Mr. Visocky of the USAID mission said the Obama administration has given high priority to biotechnology research and development and said countries like Bangladesh should take advantage of the program. He suggested that policymakers and researchers fix reasonable milestones and accomplishments.

Dr. Roberts gave a brief outline of the SABP programs to be carried out in Bangladesh under a new administrative set up with CERA being responsible for SABP activities in

Bangladesh. Dr. Chapotin expressed her satisfaction with the overall development of biosafety related activities in Bangladesh.

The majority of Biosafety Core Committee members advocated holding awareness building workshops/training for policymakers, researchers and students on recent developments in agricultural biotechnology as well as on regulatory protocols during field trials and open field release of GE plants and products. Dr. Chowdhury then mentioned that the product development and safety should go side by side. He also thanked the Obama administration for its concerns for developing countries. They also suggested involving civil society and other stake holders during decisions on the commercial approval of GE plants and products and building capacities for regulators involved in the approval process.

The meeting concluded with Mr. Shahjahan thanking attendees for participating in the meeting as well as for giving suggestions on their activities.

11TH INTERNATIONAL SYMPOSIUM ON THE BIOSAFETY OF GENETICALLY MODIFIED ORGANISMS UPCOMING IN BUENOS AIRES, ARGENTINA

Scientists and regulators interested in the biosafety of genetically modified organisms are encouraged to attend the 11th International Symposium on the Biosafety of Genetically Modified Organisms (ISBGMO 11) in Buenos Aires, Argentina from November 15-20, 2010. The theme of ISBGMO 11 is "The Role of Biosafety Research in the Decision Making Process". This symposium, which occurs every two years, brings together scientists interested in sharing results and learning from other experts in the area of biosafety research and its application to regulatory decision-making. As such, a program of workshops and talks has been developed that will encourage the exchange of scientific experiences and ideas with a focus on how biosafety research supports regu-

(continued on page 4 - see ISBGMO)



The Reading List

. . . new and notable articles

NEXT-GENERATION PROTEIN-RICH POTATO EXPRESSING THE SEED PROTEIN GENE AMA1 IS A RESULT OF PROTEOME REBALANCING IN TRANSGENIC TUBER

Chakraborty S., Chakraborty N., Agrawal L., Ghosh S., Narula K., Shekhar S., Naik P.S., Pande P.C., Chakraborti S.K., Datta A.

Protein deficiency is the most crucial factor that affects physical growth and development and that increases morbidity and mortality especially in developing countries. Efforts have been made to improve protein quality and quantity in crop plants but with limited success. Here, we report the development of transgenic potatoes with enhanced nutritive value by tuber-specific expression of a seed protein, AmA1 (Amaranth Albumin 1), in seven genotypic backgrounds suitable for cultivation in different agro-climatic regions. Analyses of the transgenic tubers revealed up to 60% increase in total protein content. In addition, the concentrations of several essential amino acids were increased significantly in transgenic tubers, which are otherwise limited in potato. Moreover, the transgenics also exhibited enhanced photosynthetic activity with a concomitant increase in total biomass. These results are striking because this genetic manipulation also resulted in a moderate increase in tuber yield. The comparative protein profiling suggests that the proteome rebalancing might cause increased protein content in transgenic tubers. Furthermore, the data on field performance and safety evaluation indicate that the transgenic potatoes are suitable for commercial cultivation. In vitro and in vivo studies on experimental animals demonstrate that the transgenic tubers are also safe for human consumption. Altogether, these results emphasize that the expression of AmA1 is a potential strategy for the nutritional improvement of food crops.

Proceedings of the National Academy of Sciences USA. (2010) 107(41):17533-8

NON-TRANSGENIC GENOME MODIFICATION IN PLANT CELLS

Ira M., Zuker A., Shklarman E., Zeevi V., Tovkach A., Roffe S., Ovadis M., Tzfira T., Vainstein A.

Zinc finger nucleases (ZFNs) are a powerful tool for genome editing in eukaryotic cells. ZFNs have been used for targeted mutagenesis in model and crop species. In animal and human cells, transient ZFN expression is often achieved by direct gene transfer into the target cells. Stable transformation, however, is the preferred method for gene expression in plant species, and ZFN-expressing transgenic plants have been used for recovery of mutants that are likely to be classified as transgenic due to the use of direct gene-transfer methods into the target cells. Here we present an alternative, non-transgenic approach for ZFN delivery and production of mutant plants using a novel Tobacco rattle virus (TRV)-based expression system for indirect transient delivery of ZFNs into a variety of tissues and cells of intact plants. TRV systemically infected its hosts and virus ZFN-mediated targeted mutagenesis could be clearly observed in newly developed infected tissues as measured by activation of a mutated reporter transgene in tobacco and petunia plants. The ability of TRV to move to developing buds and regenerating tissues enabled recovery of mutated tobacco and petunia plants. Sequence analysis and transmission of the mutations to the

next generation confirmed the stability of the ZFN-induced genetic changes. Because TRV is an RNA virus that can infect a wide range of plant species, it provides a viable alternative to the production of ZFN-mediated mutants while avoiding the use of direct plant-transformation methods.

Plant Physiology (2010) Sep 27. [Epub ahead of print]

SUSTAINABLE USE OF BIOTECHNOLOGY FOR BIOENERGY FEEDSTOCKS

Moon H.S., Abercrombie J.M., Kausch A.P., Stewart C.N. Jr.

Done correctly, cellulosic bioenergy should be both environmentally and economically beneficial. Carbon sequestration and decreased fossil fuel use are both worthy goals in developing next-generation biofuels. We believe that biotechnology will be needed to significantly improve yield and digestibility of dedicated perennial herbaceous biomass feedstocks, such as switchgrass and Miscanthus, which are native to the US and China, respectively. This Forum discusses the sustainability of herbaceous feedstocks relative to the regulation of biotechnology with regards to likely genetically engineered traits. The Forum focuses on two prominent countries wishing to develop their bioeconomies: the US and China. These two countries also share a political desire and regulatory frameworks to enable the commercialization and wide release of transgenic feedstocks with appropriate and safe new genetics. In recent years, regulators in both countries perform regular inspections of transgenic field releases and seriously consider compliance issues, even though the US framework is considered to be more mature and stringent. Transgene flow continues to be a pertinent environmental and regulatory issue with regards to transgenic plants. This concern is largely driven by consumer issues and ecological uncertainties. Regulators are concerned about large-scale releases of transgenic crops that have sexually compatible crops or wild relatives that can stably harbor transgenes via hybridization and introgression. Therefore, prior to the commercialization or extensive field testing of transgenic bioenergy feedstocks, we recommend that mechanisms that ensure biocontainment of transgenes be instituted, especially for perennial grasses. A cautionary case study will be presented in which a plant's biology and ecology conspired against regulatory constraints in a non-biomass crop perennial grass (creeping bentgrass, *Agrostis stolonifera*), in which biocontainment was not attained. Appropriate technologies that could be applied to perennial grass feedstocks for biocontainment are discussed.

Environmental Management (2010) 46(4):531-8.

OCCURRENCE AND FIELD DENSITIES OF COLEOPTERA IN THE MAIZE HERB LAYER: IMPLICATIONS FOR ENVIRONMENTAL RISK ASSESSMENT OF GENETICALLY MODIFIED BT-MAIZE

Rauschen S., Schaarschmidt F., Gathmann A.

Beetles (Coleoptera) are a diverse and ecologically important group of insects in agricultural systems. The Environmental Risk Assessment (ERA) of genetically modified Bt-crop varie-

(continued on page 4 - see Reading List)

CALENDAR OF EVENTS

Event	Organized by	Date and Venue	Website
INDIA			
National Conference on Paradigm Shift in Cotton Research and Cultivation	Navsari Agricultural University	October 20 - 22, 2010	http://www.nau.in/n.pdf
Managing Agricultural Innovations in an Era of Globalization	Indian Agricultural Research Institute	October 25 - 30, 2010 New Delhi	http://www.iari.res.in/files/training-ag-eco-25-oct.pdf
National Symposium on Food Security in Context of Changing Climate	The Society of Agricultural Professionals and Chandra Shekhar Azad University of Agriculture and Technology, Kanpur	October 30 - November 1, 2010 Kanpur	http://www.csauk.ac.in/
World Cotton Research Conference-5	International Cotton Advisory Committee (ICAC) and Indian Society for Cotton Improvement	November 7 - 11, 2010 Mumbai	http://www.icac.org/meetings/wcrc/wcrc5/wcrc5_brochure.pdf
ICAR Winter School on Molecular Techniques in Gene Isolation and Characterization	National Research Centre on Plant Biotechnology	November 8 - 28, 2010	http://www.nrcpb.org/brochure_icar_winter_school.pdf
INTERNATIONAL			
11th International Symposium on the Biosafety of Genetically Modified Organisms (ISBGMO)	International Society for Biosafety Research	November 15 - 20, 2010 Buenos, Argentina	http://www.isbgmo.info/
BIT's 4th Annual World Congress of GENE-2010: Gene Technology, Environment and Economic Growth	BIT Life Sciences, Inc.	December 1 - 4, 2010 Sanshui, Foshan, China	http://www.bitlifesciences.com/wcg2010/fullprogram.asp
6th International Plant Tissue Culture & Biotechnology Conference	Bangladesh Association for Plant Tissue Culture & Biotechnology (BAPTC&B)	December 3 - 5, 2010	http://www.bap tcb.org/ptcb_Conference_2010.pdf

ISBGMO - continued from page 2

laboratory processes especially risk assessments and ultimately science-based decisions. The Symposium sessions are:

- **Session 1:** Biosafety research challenges and experiences in Latin America
- **Session 2:** Problem Formulation - improving the quality of an environmental risk assessment
- **Session 3:** Biosafety considerations for crops for non-food/feed uses, biofuels and energy crops
- **Session 4:** GM insect developments and biosafety
- **Session 5:** Biosafety aspects of GM-based agronomic traits protecting against yield reduction due to abiotic stress
- **Session 6:** New applications of biotechnologies and their associated risk assessment issues

Workshops before (November 15) and after (November 16) the symposium have been developed to cover specific topics related to biosafety and GMOs in an informal and participatory manner. These will be moderated by experts, and allow in depth discussions of issues. Additionally, training sessions on specific topics will be organized to allow participants with less experience to interact with colleagues more experienced in the subject under discussion. In this way, global perspectives and experiences will be shared among participants. Finally, on November 20, registrants will be able to participate in a field day excursion to learn about GE crop production in Argentina.

For more information go to <http://www.isbgmo.info/>.

READING LIST - continued from page 3

ties with insect resistances thus needs to consider and assess the potential negative impacts on non-target organisms belonging to this group. We analysed data gathered during 6 years of field-release experiments on the impact of two genetically modified Bt-maize varieties (*Ostrinia*-resistant MON810 and *Diabrotica*-resistant MON88017) on the oc-

currence and field densities of Coleoptera, especially the two families Coccinellidae and Chrysomelidae. Based on a statistical analysis aimed at establishing whether Bt-maize varieties are equivalent to their near-isogenic counterparts, we discuss the limitations of using field experiments to assess the effects of Bt-maize on these two beetle families. The densities of most of the beetle families recorded in the herb layer were very low in all growing seasons. Coccinellidae and Chrysomelidae were comparatively abundant and diverse, but still low in numbers. Based on their role as biological control agents, Coccinellidae should be a focus in the ERA of Bt-plants, but given the large natural variability in ladybird densities in the field, most questions need to be addressed in low-tier laboratory tests. Chrysomelidae should play a negligible role in the ERA of Bt-plants, since they occur on-crop as secondary pests only. Species occurring off-crop, however, can be addressed in a similar fashion as non-target Lepidoptera in Cry1Ab expressing Bt-maize.

Transgenic Research (2010) 19(5):727-44.

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