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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.

INTERACTIVE MEETING ON "NOVEL BIOTECHNOLOGIES FOR DENGUE/ CHIKUNGUNYA VECTOR CONTROL: AN UPDATE" HELD IN INDIA

In recent years, vector-borne diseases (VBD) have emerged as a serious public health problem in India. Many of these, particularly dengue fever and malaria, have become almost annual epidemics causing considerable morbidity and mortality. Dengue is spreading rapidly to newer areas with more frequent outbreaks. Chikungunya, having re-emerged in India after a gap of more than three decades, is affecting many states. According to National Vector Borne Disease Control Programme (NVBDCP) statistics, the number of dengue cases in India reached an all-time high of 32,263 in 2012 (up to November 5, 2012).

The World Health Organization (WHO) estimates that around 40 percent of the world's population is at risk of dengue virus infection. Every year the virus infects 50 to 100 million people, causing classic dengue fever as well as more severe symptoms such as dengue haemorrhagic fever and dengue shock syndrome.

Vector control has long been seen as the major available tool against vector-borne diseases. Many mosquito control strategies are based on suppressing or eliminating the insect population using insecticides and pesticides. With biotechnological advancements, it has been observed that genetic transformation of disease spreading mosquitoes has the potential to provide new opportunities for effective vector control against diseases such as dengue, chikungunya and malaria. In this context two novel technologies have been developed to control the spread of the dengue virus via its vector *Aedes aegypti*. The first major breakthrough, developed by M/s. Oxitec Ltd., UK, is male sterile genetically engineered (GE) mosquitoes who, on mating with wild females, produce an offspring that will not survive to adulthood. As these sterile GE male mosquitoes are released and monitored in a specific area over a predetermined and sustained period of time, it ultimately leads to significant reduction in the mosquito population. Field releases with such mosquitoes have been successfully conducted in Brazil and Cayman Islands. It was observed that Oxitec's technology is not only very effective, it is safe, sustainable and also protects the environment. The second major breakthrough was by a research team led by Prof. Scott O'Neill at Monash University in Melbourne, Australia. They injected the bacterium '*Wolbachia pipientis*', which is harmless to humans and common among insects, into the eggs of mosquitoes. This bacterium made the mosquito resistant to the dengue virus and also stopped them from transmitting that disease to humans. Prof. O'Neill and his team released those mosquitoes in two Queensland towns in January 2011 and achieved encouraging results of almost 90 percent.

Keeping in view the above, an interactive meeting on "Novel Biotechnologies for Dengue/ Chikungunya Vector Control : An Update" was organized by Biotech Consortium India Limited (BCIL) to discuss recent global developments for the control of vector borne diseases with concerned scientific organizations and policy makers under the guidance of Dr. V.M. Katoch, Secretary of the Department of Health Research and Director General of the Indian Council of Medical Research (ICMR) on December 10, 2012 at New Delhi.

The objective of the meeting was to learn about and discuss biotech-based vector control strategies for dengue and chikungunya and their implications and usefulness with respect to the Indian environment. More than 50 participants attended the meeting. Dr. Vibha Ahuja, General Manager of BCIL, welcomed the participants and gave a brief background on the relevance of the technology. Dr. S.R Rao, an advisor to the Department of Biotechnology (DBT), provided an overview of initiatives by DBT in developing diagnostics, vaccines, etc., for dengue control. He stressed the importance of baseline information while evaluating various technological options for effective vector control for dengue/chikungunya. Dr. Rao also talked about the regulatory requirements to undertake activities involving genetically engineered organisms. Dr. Rao mentioned that GE insects under development in India are silkworm and

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mosquitoes and that silkworm being produced in contained conditions is slightly easier to monitor as compared to mosquitoes. He said that the process of developing guidelines to undertake activities with GE insects has already been initiated.

In his remarks, Dr. Katoch advised that the dynamics of dengue and chikungunya have so far been unpredictive. Dr. Katoch pointed toward the need to develop protective measures *viz.* methods for quick diagnosis, vaccines, etc., for vector borne diseases. Referring to the use of novel biotechnology based options, Dr. Katoch indicated that the expression level of diseases varies from country to country and the requirements will not be strictly the same in the case of the Indian ecosystem but all available options should be explored and efforts must be continued in a positive direction. He advocated for effective communication outreach and public engagement with stakeholders in a transparent manner as and when such technologies are tested.

Dr. Kalpana Baruah, Joint Director of the National Vector Borne Disease Control Programme, presented updated information on national strategies for the prevention and control of the burden of dengue disease in India. Prof. Luke Alphey from M/s. Oxitec, UK, gave a presentation on the use of genetically engineered *Aedes aegypti* strain as a sterile male technique by using Release of Insects carrying a Dominant Lethal (RIDL) technology. Prof. Alphey also informed that the RIDL and Sterile Insect Technology (SIT) methods are self limiting as the modification will be eliminated from the population unless maintained by periodic releases. Dr. Aldo Malavasi, President of Moscamed, Brazil, spoke about the experience of open releases of male sterile mosquitoes in the villages of Itaberaba and Mandacaru. He illustrated the comparable dispersal and longevity data between OX513A and Itaberaba strains and the effectiveness of RIDL technology in the suppression of the mosquito population during field release. Dr Malavasi gave an interesting account of the well structured communication activities undertaken prior to the field releases in order to create awareness among all concerned. He also spoke about extensive support including a financial grant to undertake the trials from the state government. Dr. T. Jeyalakshmi, a scientist at the International Institute of Biotechnology and Toxicology (IIBAT), Tamil Nadu, gave an overview of the IIBAT experience related to the studies on *Aedes aegypti* RIDL strain in an Arthropod Containment Level (ACL) facility in India.

Dr. Sarala K. Subbarao, a consultant to the Vector Science Forum, ICMR, and former Director of the National Institute of Malaria Research, provided insight on the second technology based on *Wolbachia*-based *Aedes aegypti* strain that cannot transmit dengue virus to humans and the associated cytoplasmic incompatibility phenomenon for vector population suppression. Dr. B.K. Tyagi, Director of the Centre for Research in Medical Entomology, spoke about biosafety assessment of GE mosquitoes. Dr. Vibha Ahuja, General Manager of Biotech Consortium India Limited gave an overview of the available guidance for regulatory approvals of GE arthropods including mosquitoes.

There was an open discussion and exchange of information among the speakers and the participants. All the participants appreciated the breakthroughs in novel biotechnologies and were impressed by the effectiveness of the field trials so far. It was recommended that possibilities for the application of these technological options should be explored in India and the exchange of information must continue.

You can email at vibhaahuja.bcil@nic.in for proceedings of the meeting and copies of the presentations.

A SUMMARY OF ISBGMO12

Prof. Zeba I. Seraj, Department of Biochemistry and Molecular Biology, University of Dhaka

The 12th International Symposium on Biosafety of Genetically Modified Organisms (ISBGMO12), organized by the International Society for Biosafety Research (ISBR), was held at the Millennium Hotel in St. Louis Missouri, USA September 16 - 20, 2012. Donald Danforth Plant Science Center was the local host. The event was supported by the Center for Environmental Risk Assessment (CERA), United States Agency for International Development (USAID) and Interantional Centre for Genetic Engineering and Biotechnology (ICGEB) and facilitated by the International Food Policy Research Institute (IFPRI). Sponsors were Crop Life International, Agricultural Stewardship Technical Committee and United Soybean Board.

This year's theme was "Considering Biosafety in the Application of Biotechnology to Meet the Changing Needs of Agriculture, Health and the Environment". There were ~500 participants from all continents. The conference deliberations began with an overview that acknowledged that there are 200 thousand more mouths to feed every day and GM crops, which have had no unanticipated effects on human or animal health or the environment recorded to date, are currently being planted on 160 million hectares of land. Other highlights included: considerable gains in yield; reduced use of inputs like insecticides; and soil conservation through reduced tillage. Furthermore, in Brazil, where GM crops have been commercially adopted, reported returns for GM crops are nearly US $4 per dollar of investment. The current status of GM crops was given context when compared with 1992 figures when there was one crop with one trait in one country. There are now 29 countries, 40 different crops, and 25 traits. First generation GM crops were mainly herbicide and Lepidoptera tolerant. Currently GM traits being targeted are those that provide resistance to aphids, nematodes and rust-causing fungi, which are known to destroy specific crops completely. Other traits like increased omega-3 fatty acid in soybean oil, increased yield and nitrogen uptake as well as drought tolerance are in the pipeline. Biofuels are being produced by transgenic plants in the laboratory with a range of different plant types being modified.

The conference reported that no evidence had been found of increased safety risks in GM crops as compared to traditional plant breeding with respect to gene disruption or creation of a cryptic reading frame. Transgene insertion results in double stranded repair very similar to DNA movement occurring naturally within the crop genome. It was also reported that no risk of horizontal gene transfer from transgenic plants to bacteria has been found.

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Environmental risk assessment was also on the agenda. Determining the environmental risks of GMOs necessitates clear identification of the problems that can be anticipated with the introduction, which depends on the nature or biology of the plant being modified, defining and identifying any differences (from the wild type plant) that may plausibly lead to harm, defining the likely environmental interactions, if any, and, lastly, identifying the level of exposure. For example, for maize planted in the European Union, potential harm resulting from pollen-mediated gene flow to sexually compatible wild relatives is not a problem that requires analysis because of the absence of wild relatives.

Some transgenic animals, fish and insects that may be approved for release very soon were also discussed. These included rapid growth transgenic Atlantic salmon; goats that produce milk containing recombinant human antithrombin; and genetically modified sterile male insects that mate with disease producing females but do not produce offspring, thereby causing the population of the disease-causing insects to decline.

Deployment of some new plant breeding technologies and transformation technologies was also mentioned. These included RNA interference (RNAi) to silence disease-causing genes and zinc-finger nuclease and oligonucleotide-directed mutagenesis for sequence-specific insertions in the host genome.

The conference ended with two field visits. The first was to the Donald Danforth Plant Science Center, a private, not-for-profit research center working to increase biotic and abiotic stress tolerance as well as nutritional enhancement of plants. Many of their projects are in collaboration with African and Asian countries. The other visit was to Monsanto, a privately owned agricultural technology business leader with 20,000 employees in 130 countries and a research and development investment of US $1.4 billion dollars in 2011. Two significant near-releases are likely to be drought tolerant hybrid corn and drought tolerant wheat.

The Reading List

. . . new and notable articles

CHARACTERISING MICROBIAL PROTEIN TEST SUBSTANCES AND ESTABLISHING THEIR EQUIVALENCE WITH PLANT-PRODUCED PROTEINS FOR USE IN RISK ASSESSMENTS OF TRANSGENIC CROPS

Raybould A, Kilby P, Graser G

Most commercial transgenic crops are genetically engineered to produce new proteins. Studies to assess the risks to human and animal health, and to the environment, from the use of these crops require grams of the transgenic proteins. It is often extremely difficult to produce sufficient purified transgenic protein from the crop. Nevertheless, ample protein of acceptable purity may be produced by over-expressing the protein in microbes such as *Escherichia coli*. When using microbial proteins in a study for risk assessment, it is essential that their suitability as surrogates for the plant-produced transgenic proteins is established; that is, the proteins are equivalent for the purposes of the study. Equivalence does not imply that the plant and microbial proteins are identical, but that the microbial protein is sufficiently similar biochemically and functionally to the plant protein such that studies using the microbial protein provide reliable information for risk assessment of the transgenic crop. Equivalence is a judgement based on a weight of evidence from comparisons of relevant properties of the microbial and plant proteins, including activity, molecular weight, amino acid sequence, glycosylation and immuno-reactivity. We describe a typical set of methods used to compare proteins in regulatory risk assessments for transgenic crops, and discuss how risk assessors may use comparisons of proteins to judge equivalence.

TRANSGENIC RESEARCH (2012) OCT 12. [EPUB AHEAD OF PRINT] http://link.springer.com/article/10.1007/s11248-012-9658-3

RNAI-MEDIATED ULTRA-LOW GOSSYPOL COTTONSEED TRAIT: PERFORMANCE OF TRANSGENIC LINES UNDER FIELD CONDITIONS

Palle SR, Campbell LM, Pandeya D, Puckhaber L, Tollack LK, Marcel S, Sundaram S, Stipanovic RD, Wedegaertner TC, Hinze L, Rathore KS

Cottonseed remains a low-value by-product of lint production mainly due to the presence of toxic gossypol that makes it unfit for monogastrics. Ultra-low gossypol cottonseed (ULGCS) lines were developed using RNAi knockdown of δ-cadinene synthase gene(s) in *Gossypium hirsutum*. The purpose of the current study was to assess the stability and specificity of the ULGCS trait and evaluate the agronomic performance of the transgenic lines. Trials conducted over a period of 3 years show that the ULGCS trait was stable under field conditions and the foliage/floral organs of transgenic lines contained wild-type levels of gossypol and related terpenoids. Although it was a relatively small-scale study, we did not observe any negative effects on either the yield or quality of the fibre and seed in the transgenic lines compared with the nontransgenic parental plants. Compositional analysis was performed on the seeds obtained from plants grown in the field during 2009. As expected, the major difference between the ULGCS and wild-type cottonseeds was in terms of their gossypol levels. With the exception of oil content, the composition of ULGCS was similar to that of nontransgenic cottonseeds. Interestingly, the ULGCS had significantly higher (4%-8%) oil content compared with the seeds from the nontransgenic parent. Field trial results confirmed the stability and specificity of the ULGCS trait suggesting that this RNAi-based product has the potential to be commercially viable. Thus, it may be possible to enhance and expand the nutritional utility of the annual cottonseed output to fulfil the ever-increasing needs of humanity.

PLANT BIOTECHNOLOGY JOURNAL. (2012) OCT 18. DOI: 10.1111/PBI.12013. [EPUB AHEAD OF PRINT] http://onlinelibrary.wiley.com/doi/10.1111/pbi.12013/abstract

CALENDAR OF EVENTS

Event	Organized by	Date and Venue	Website
INDIA			
Winter school on Molecular Breeding Approaches for Genetic Enhancement in Oilseed Crops	Directorate of Oilseeds Research	December 1 - 21, 2012 Hyderabad	http://dor-icar.org.in/media/docs/winter-school-dec-2012.pdf
2nd Jammu and Kashmir Agricultural Science Congress	Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu	December 15 - 17, 2012 Jammu	http://www.skuast.org/new/science-congress/brochure-science.pdf
North Zone Meeting of Indian Society of Mycology and Plant Pathology and National Symposium on Emerging Trends in Plant Pathology	Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu	December 19 - 20 2012 Jammu	http://www.skuast.org/new/training/sympo-plantpathology.pdf
National Training Workshop on Applications of Genomics in Crop Improvement	G.B. Pant University of Agriculture & Technology	December 27 – January 16, 2013 Pantnagar	http://www.gbpuat.ac.in/
National Convention on India Cotton: Gearing Up for Global Leadership	The Gujarat Association for Agricultural Sciences, Navsari; Indian Society For Cotton Improvement, Mumbai; Navsari Agricultural University, Surat; and Central Institute for Cotton Research, Nagpur	January 6 - 8, 2013 Surat	http://www.nau.in/announce.php?id=686
10th National Symposium on Biotechnological Approaches for Plant Research: Constraints and Opportunities	ICAR Research Complex for Goa and Society for Plant Protection Sciences	January 27 - 29, 2013 Goa	http://icargoa.res.in/Goa_Symposium_2013_brochure.pdf
International Conference on Agriculture and Climate Change (ICACC2012)	The Energy and Resources Institute (TERI)	January 29 - 30, 2013 New Delhi	http://www.teriin.org/index.php?option=com_events&task=details&sid=530
Bangalore INDIA BIO 2013	Government of Karnataka and Vision Group on Biotechnology	February 4 – 6, 2013 Bangalore	http://www.bangaloreindiabio.in/BIO2013/index.php
Indian Seed Congress 2013	National Seed Association of India	February 7 - 9, 2013 New Delhi	http://nsai.co.in/isc/
International Conference on Advances in Biotechnology and Patenting (ICABP -2013)	Bharatidasan University	February 18 – 21, 2013 Tiruchirapalli, Tamil Nadu	http://icabp2013.webnode.com/
INTERNATIONAL			
Theoretical and Practical Course on the Detection of GMOs in Food and Agricultural Products	International Centre for Genetic Engineering and Biotechnology (ICGEB)	January 6-10, 2013 Doha, Qatar	http://www.icgeb.org/meetings-2013.html
World Soybean Research Conference IX	Hosted by the Protein Research Foundation, the Oil and Protein Seeds Development Trust, and organized by Paragon Conventions	February 17 - 22, 2013 Durban, South Africa	http://www.wsrc2013.co.za/
Strategic Approaches in the Evaluation of the Science Underpinning GMO Regulatory Decision Making	ICGEB	July 1 - 5, 2013 Trieste, Italy	http://www.icgeb.org/tl_files/Meetings/2013/TS_BIOSAFETY_1-5%20July_2013.pdf

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