SOUTH ASIA
BIOSAFETY PROGRAM

February 2010
Vol.6 No.2

NEWSLETTER

for private circulation only - not for sale

www.agbios.com/sabp

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.

DECISION ON COMMERCIALISATION OF BT BRINJAL (INDIA)

Ministry of Environment and Forests

Following a series of nationwide consultations, the Minister for Environment and Forests (I/C) announced his decision on the production and use of Bt brinjal. He also made public a copy of his exhaustive report which relies on inputs received from stakeholders from all across the spectrum of scientists, civil society, academics, Chief Ministers of various states and others concerned. Following is an excerpt from the statement issued today:

"Based on all the information presented in the preceding paragraphs and when there is no clear consensus within the scientific community itself, when there is so much opposition from the state governments, when responsible civil society organisations and eminent scientists have raised many serious questions that have not been answered satisfactorily, when the public sentiment is negative and when Bt-brinjal will be the very first genetically-modified vegetable to be introduced anywhere in the world and when there is no over-riding urgency to introduce it here, it is my duty to adopt a cautious, precautionary principle-based approach and impose a moratorium on the release of Bt-brinjal, till such time independent scientific studies establish, to the satisfaction of both the public and professionals, the safety of the product from the point of view of its long-term impact on human health and environment, including the rich genetic wealth existing in brinjal in our country.

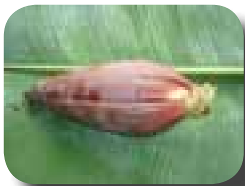
A moratorium implies rejection of this particular case of release for the time being; it does not, in any way, mean conditional acceptance. This should be clearly understood."

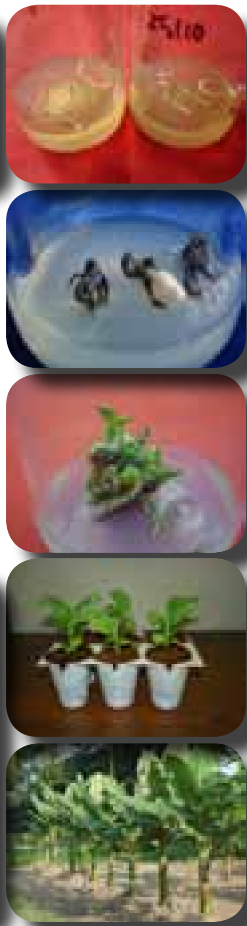
The Minister's report and companion Annexures can be downloaded from http://moef.nic.in/index.php.

ANTHER CULTURE IN BANANA

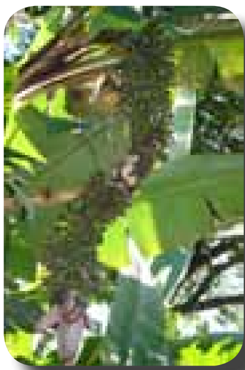
L. Hakim, Institute of Food and Radiation Biology, Bangladesh Atomic Energy Commission, email: lhakim@dhaka.net

Banana comprises nearly 42 per cent of the total fruit production in Bangladesh and its financial return as a crop is higher compared to other fruits and also cereals like rice, wheat and maize. Since most of the edible bananas are sterile polyploids, highly heterozygous and propagated vegetatively, genetic improvement in banana by conventional breeding is an insurmountable task. Mutagenic agents such as gamma radiation can be used in shoot tips to create genetic variation for selection of desired mutants in banana. But, the main limitation of mutation induction techniques is that treated shoot tips show a high degree of chimerism. Mutation is a single cell event and regeneration of plants from mutated single cell can play a significant role in the improvement of banana. Although most of the edible bananas are triploids there are some diploid bananas having viable pollen, e.g., *Musa balbisiana* (BB), *M. acuminata* ssp. *burmannicoides* (Calcutta 4) (AA). The production of doubled haploids using anther/pollen culture can lead to the production of homozygous individuals in single generation. Once the protocol is established, regeneration of plants from irradiated anthers (pollens) of banana could play a significant role in getting banana plants with greater





(clockwise from top left) Male bud of *Musa balbisiana* var. Bichikala (BB); anthers in culture medium; induction of callus; regeneration of shoots; acclimatized plantlets; anther culture derived plants in the field; and bunch of anther derived plant.



(continued on page 2 - see Banana)

CALENDAR OF EVENTS			
Event	Organized by	Date and Venue	Website
INDIA			
Second National Conference on Biotechnology World 2010: Start Up with Biotechnology	Department of Biotechnology Dayanand Academy of Management Studies (DAMS)	February 20, 2010 Kanpur	http://dams-biotech-world2010.webs.com/
Workshop on Commercialization of Biotechnology	Biotech Consortium India Limited	February 25, 2010 India International Centre, New Delhi	http://www.bcil.nic.in
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
One-day Workshop on Emerging Role of Biotechnology in Industries	Foundation for Innovation and Technology Transfer, Indian Institute of Technology Delhi	February 26, 2010 New Delhi	http://www.iitd.ac.in/events/brochure-biotech-nollgy-%2026-feb-2010-dks.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
Bangalore India Bio 2010		June 2 – 4, 2010 Bangalore	http://www.bangalorebio.in/BIO2010/index.php
Agricultural biotechnologies in developing countries: Options and Opportunities in Crops, Forestry, Llivestock, Fisheries and Agro-industry to Face the Challenges of Food Insecurity and Climate Change (ABDC-10)	Food and Agriculture Organization (FAO), Government of Mexico and International Fund for Agricultural Development	March 1 – 4 2010 Guadalajara, Mexico,	http://www.fao.org/biotech/abdc/conference-home/en/
Biosafety Course on Introduction to Risk Analysis of GMO	Kuwait Institute for Scientific Research	April 25 - 29, 2010 Safat, Kuwait	http://www.icgeb.org/meetings-and-courses.html
Biotech World 2010	Department of Biotechnology, Faculty of Sciences of the University of Oran, Sénia	April 26 - 29, 2010 Oran, Algeria	http://biotex-eng.webn-ode.com/

Banana - *continued from page 1*

genetic variation, which in turn may lead to the development of improved varieties.

A program was initiated at the Plant Biotechnology Division, Institute of Food and Radiation Biology of Bangladesh Atomic Energy Commission to produce doubled haploids in banana using anther culture. The diploid seeded variety "Bichikala" derived from the diploid wild species *Musa balbisiana* was used in this study. The male flower bud was used as donor material for anther isolation. Five anthers containing mostly uni-nucleate pollen were placed in culture jar containing agar solidified MS or N6 medium supplemented with growth regulators like BA and IAA. Both the media responded to produce calli, which formed after four to eight months of culture, but the frequency of callus formation was very low, which accounted to 0.4 per cent for MS and 0.2 per cent for N6 media. Regeneration of plants occurred when these calli were transferred to fresh media with a comparatively lower concentration of BA and IAA. Flow cytometry analysis of anther derived plant suggested that these are diploid. PCR analysis using random primers showed that there was variation in DNA level between parent and anther derived plant. All anther derived plants produced bunches that contained only 5/6 fingers per hand and bunches were abnormal.

From the overall result it is observed that the frequency of anther response towards callus induction and subsequent regeneration is very low. The efficiency of anther response/plant regeneration needs to be improved by manipulating medium composition and by increasing the number of genotypes of the donor plants because the effect of genotype is one of the important factors that affect the efficiency of anther culture.

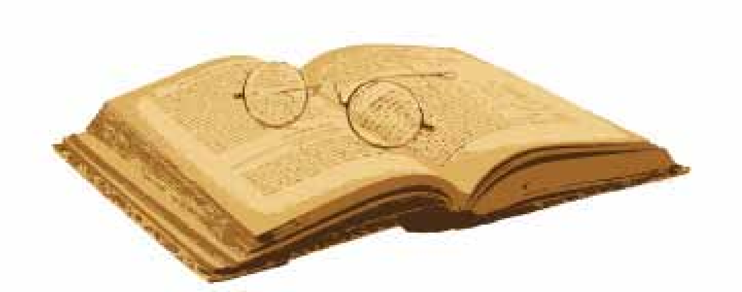
PLANT BIOTECHNOLOGY RESEARCH ACTIVITIES AT BANGLADESH IFRB

Dr. Md. Lokman Hakim, Chief Scientific Officer & Head, Plant Biotechnology and Genetic Engineering Division, Institute of Food and Radiation Biology (IFRB), Atomic Energy Research Establishment (AERE), Bangladesh Atomic Energy Commission, E-mail: lhakim@dhaka.net / pbged@dhaka.net

The Plant Biotechnology Division was one of the pioneer laboratories in the country to initiate research on plant tissue culture in the early eighties with micropropagation of forest trees. Later, other crop plants like cereals, fruit, medicinals, ornamentals and vegetables were included in the program. In the mid-nineties research on *Agrobacterium*-mediated genetic transformation was initiated with the fibre crop jute. This technique has been gradually expanded to other plants of economic importance.

Research activities of this division are focused mainly in two areas (i) plant tissue culture (micropropagation) including *in vitro* mutagenesis and (ii) genetic transformation. Micropropagation technique is applied for multiplication of forest, fruit, medicinal and ornamental plants, while *in vitro*

(continued on page 4 - see IFRB)



The Reading List

. . . new and notable articles

TOWARD A QUARTER CENTURY OF PATHOGEN-DERIVED RESISTANCE AND PRACTICAL APPROACHES TO PLANT VIRUS DISEASE CONTROL

J. Gottula and M. Fuchs

The concept of pathogen-derived resistance (PDR) describes the use of genetic elements from a pathogen's own genome to confer resistance in an otherwise susceptible host via genetic engineering [Journal of Theoretical Biology 113 (1985) 395]. Illustrated with the bacteriophage Qbeta in *Escherichia coli*, this strategy was conceived as a broadly applicable approach to engineer resistance against pathogens. For plant viruses, the concept of PDR was validated with the creation of tobacco plants expressing the coat protein gene of Tobacco mosaic virus (TMV) and exhibiting resistance to infection by TMV [Science 232 (1986) 738]. Subsequently, virus-resistant horticultural crops were developed through the expression of viral gene constructs. Among the numerous transgenic crops produced and evaluated in the field, papaya resistant to Papaya ringspot virus (PRSV) [Annual Revues Phytopathol 36 (1998) 415] and summer squash resistant to Cucumber mosaic virus (CMV), Zucchini yellow mosaic virus, and/or Watermelon mosaic virus [Biotechnology 13 (1995) 1458] were released for commercial use in the USA. Although cultivated on limited areas, the adoption rate of cultivars derived from these two crops is increasing steadily. Tomato and sweet pepper resistant to CMV and papaya resistant to PRSV were also released in the People's Republic of China. Applying the concept of PDR provides unique opportunities for developing virus-resistant crops and implementing efficient and environmentally sound management approaches to mitigate the impact of virus diseases. Based on the tremendous progress made during the past quarter century, the prospects of further advancing this innovative technology for practical control of virus diseases are very promising.

Advances in Virus Research. 2009;75:161-83. Epub 2010 Jan 13.

EVALUATION AND APPLICATION OF A LUCIFERASE FUSION SYSTEM FOR RAPID *IN VIVO* ANALYSIS OF RNAI TARGETS AND CONSTRUCTS IN PLANTS

R.G. Birch, B. Shen, B.J. Sawyer, E. Huttner, W.Q. Tucker, A.S. Betzner

The practical use of RNA-mediated approaches including antisense RNA, ribozymes and siRNAs for specific inhibition of gene expression is limited by lack of simple quantitative methods to rapidly test efficacy in vivo. There have been indications that cotransfer of target::reporter gene fusions with constructs designed against the target sequence, followed by quantification of transient reporter gene activity might be effective. Here, we report detailed testing of the approach in plants, using diverse target::luciferase fusions and antisense or ribozyme constructs. We used quantitative transient luciferase activity (Luc) assays to test antisense constructs against beta-glucuronidase, PR glucanase, vacuolar invertase and cucumber mosaic virus, as well as ribozymes against watermelon mosaic virus and tobacco anionic peroxidase. For constructs previously tested in transgenic plants, the results correspond well with those from the transient expression assay. Target susceptibility was generally not strongly influenced by luciferase fusion, and the assay was not highly dependent on target sequence length. Some sequences reduced Luc activity below the level for reliable quantification, but suitable alternative fusions were readily produced. Transcriptional and translation fusions were effective for 5' target::luc constructs. Translational fusions were more reliable for luc::target 3' constructs. With minimal preliminary work to prepare suitable target::luciferase fusions, the approach appears generally applicable for rapid in vivo validation of effectiveness and specificity of constructs designed for RNA-mediated down-regulation of plant genes.

Plant Biotechnology Journal 2010 Jan 19. [Epub ahead of print]

FIELD-EVOLVED INSECT RESISTANCE TO BT CROPS: DEFINITION, THEORY, AND DATA

B.E. Tabashnik, J.B. Van Rensburg, Y. Carrière

Transgenic crops producing *Bacillus thuringiensis* (Bt) toxins for insect pest control have been successful, but their efficacy is reduced when pests evolve resistance. Here we review the definition of field-evolved resistance, the relationship between resistance and field control problems, the theory underlying strategies for delaying resistance, and resistance monitoring methods. We also analyze resistance monitoring data from five continents reported in 41 studies that evaluate responses of field populations of 11 lepidopteran pests to four Bt toxins produced by Bt corn and cotton. After more than a decade since initial commercialization of Bt crops, most target pest populations remain susceptible, whereas field-evolved resistance has been documented in some populations of three noctuid moth species: *Spodoptera frugiperda* (J. E. Smith) to Cry1F in Bt corn in Puerto Rico, *Busseola fusca* (Fuller) to CrylAb in Bt corn in South Africa, and *Helicoverpa zea* (Boddie) to CrylAc and Cry2Ab in Bt cotton in the southeastern United States. Field outcomes are consistent with predictions from theory, suggesting that factors delaying resistance include recessive inheritance of resistance, abundant refuges of non-Bt host plants, and two-toxin Bt crops deployed separately from one-toxin Bt crops. The insights gained from systematic analyses of resistance monitoring data may help to enhance the durability of transgenic insecticidal crops. We recommend continued use of the longstanding definition of resistance cited here and encourage discussions about which regulatory actions, if any, should be triggered by specific data on the magnitude, distribution, and impact of field-evolved resistance.

Journal of Economic Entomology 102(6): 2011Ð2025 (2009)
View PDF at http://www.entsoc.org/btcrops.pdf

IFRB - *continued from page 2*

mutagenesis (biotechnology in conjunction with gamma irradiation) is utilized for the improvement of crop plants like cereals, fruit, and vegetables. Genetic transformation is carried out using *Agrobacterium*-mediated transformation and is mostly used for the development transformation protocol as well as improvement of specific traits by the insertion of specific genes in plants of interest. Scientists of this laboratory have been working, in collaboration with International Atomic Energy Agency (IAEA), on a program to improve bananas through *in vitro* mutagenesis and doubled haploids techniques. They are also working to improve quality or composition of rice using mutation techniques and biotechnology under the Forum for Nuclear Cooperation in Asia program. Until now the regeneration protocols of a number of forest, fruit, medicinal and ornamental plants have been developed while *Agrobacterium*-mediated genetic transformation in jute, potato, papaya, wood apple, rice and others have been established. Regeneration of banana plants using anther culture is a recent success story of this laboratory.

IFPRI DISCUSSION PAPER PUBLISHED

The 60-page International Food Policy Research Institute (IFPRI) discussion paper Labeling Genetically Modified Food in India - Economic Consequences in Four Marketing Channels by Dr. Sangeeta Bansal and Dr. Guillaume Gruère is now available on the IFPRI website.

In 2006, India proposed a draft rule requiring the labeling of all genetically modified (GM) foods and products derived thereof. The authors used primary and secondary market data to assess the economic implications of introducing such a mandatory labeling policy for GM food. It focuses on four products that would likely be the first affected by such a regulation in India: cottonseed oil, soybean oil, brinjal (eggplant), and rice.

View the full paper at http://www.ifpri.org/sites/default/files/publications/ifpridp00946.pdf.

INDIA'S GENETICALLY MODIFIED MISTAKE

Rajesh Kumar - Wall Street Journal - February 11, 2010

Without agriculture's Green Revolution, India never would have been able to feed its booming population in the late 20th century. By rejecting the Gene Revolution this week, the Congress-led government in New Delhi now threatens the ability of Indian farmers to increase the yield, quality and safety of the food they produce for their more than one billion fellow citizens.

On Tuesday, environment and forestry minister Jairam Ramesh ignored the findings of a scientific panel that had declared genetically modified brinjal safe for human consumption. He called for more study, but his decision has nothing to do with a genuine need for additional research. Instead, he bowed to political pressure from Greenpeace and other antibiotechnology organizations.

Farmers in North and South America have enjoyed the bounties of the Gene Revolution for more than a decade. Genetically modified corn and soybeans have increased yields and decreased the need for pesticide. In the United States, Canada, Brazil, and Argentina, people eat food derived from biotechnology every day. Mr. Ramesh had the opportunity to let Indian farmers reap similar benefits in one of its most important food crops, as brinjal is a staple in many parts of the country.

The experience of agriculture biotechnology in India and around the world is instructive. In 2002, New Delhi granted farmers the right to cultivate genetically modified cotton. Today, we harvest more than 20 million acres of it. The practice has spread quickly because it lowers input costs and increases productivity. Farmers wish the seeds were less expensive, but they've come to understand that investments in biotechnology represent good value.

Scientists have learned how to transfer similar advantages into brinjal, which Americans call eggplant and Europeans call aubergine. They've created a variety of the plant that naturally resists pests, using the same principle that has improved cotton. The potential gains are enormous. Brinjal takes a long time to grow, which means that it is more vulnerable to pest attacks than other crops. What's more, many of India's farmers are poorly educated and don't know how to get the most out of existing pesticides. They're at the mercy of dealers who too often provide them with improper instructions and inferior products.

Genetically modified brinjal has many benefits. It has a built-in resistance to pests. At the same time, it's actually easier to grow because it requires fewer applications of pesticides. Because of these qualities, genetically modified brinjal has the potential to let us produce better and safer food. Its adoption would cause prices for consumers to fall. We would improve our ability to fight malnutrition, which is a major problem for the people of India. The success of genetically modified brinjal also would create a compound effect by encouraging the application of biotechnology to other food crops.

Biotechnology also would deliver an economic benefit. Higher farm productivity would help address the looming problem of income disparity between the rich and the poor, as well as between urban areas and rural regions.

Opponents say that they're worried about human health, but they can point to no actual evidence of a threat. Last fall, a government body called the Genetic Engineering Approval Committee declared genetically modified brinjal safe for consumption. The decision was based on extensive study that involved agricultural research institutes, universities, and a pair of expert panels, including one appointed by the Supreme Court.

India has a desperate need for agricultural biotechnology. If we are going to produce enough food for our people, farmers must have access to the same tools as growers in the developed world. We must participate in the Gene Revolution.

SABP CONTACTS

South Asia

Dr. Vibha Ahuja
General Manager
Biotech Consortium India Limited
Anuvrat Bhawan, 5th Floor
210, Deendayal Upadhyaya Marg
New Delhi 110 002 India
Tel: 23219064-67
Email: vibhaahuja@biotech.co.in

Others

Center for Environmental Risk Assessment (CERA)
ILSI Research Foundation
1156 Fifteenth Street, N.W., 2nd Floor
Washington D.C.
20005-1743 USA
Email: mmclean@ilsi.org

To receive an electronic copy of this newletter send your name and e-mail address to: info@agbios.com