



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.

DON'T FEAR TRANSGENIC CROPS

A BAN ON THE USE OF CROPS WITH TRANSGENIC TRAITS IS UNSCIENTIFIC AND INDIA NEEDS NEW TECHNOLOGIES TO RAISE FARM YIELDS

Dr. Deepak Pental works on mustard breeding, teaches genetics and is former vice-chancellor of the University of Delhi. Originally published in **The Economic Times** Delhi; June 14, 2012; Section: Policy; Page: 13.

Science and technology hold the key to developing low-input, high-output agriculture. The challenge is to use new technologies creatively and to make evidence-based decisions on the deployment of new technologies. Crop breeding is carried out to meet two broad objectives: one, to increase yields of a crop *per se* and, two, to protect the yield potential by developing crops resistant to diseases, pests and environmental extremes. Both yield-enhancement and yield-stabilisation are critical for feeding a global population of over seven billion, and still increasing, and for meeting current and emerging challenges of sustainable development.

India needs a second green revolution: one that is based on low-input, high-output agriculture, frugal use of natural resources and diversification of agricultural activities. Deceleration in crop productivity and agricultural growth since the 1990s should be a major national concern. India has a serious deficit of edible oils and grain legumes; around 50% of our edible oil requirements are being met through imports. Our farmers are toiling hard on the land, but not reaping enough benefits due to low productivity of our crops.

Increase in crop productivity can only occur if we use the best and the latest that science and technology have to offer and intensify our national efforts in research and development. Since the 1990s, two new techniques have been added to the repertoire of plant breeding: one, marker-assisted breeding and, two, development of transgenic crops. Both the techniques allow more precise genetic modification of crops. The implication of transgenic technologies is more dramatic as these allow a gene from any biological source to be introduced into a crop. Opponents of transgenic technology want a ban on the use of crops with transgenic traits. This is an irrational, antiscience and anti-development view.

A number of myths and lies are being propagated about transgenic technologies. One great myth is that genetic modification of crops only started with the transgenic technologies, otherwise, every crop existed in the pristine form in which it was domesticated. Hence the name GM crops. Nothing can be farther from the truth. Genetic modification of crops for human use has been going on since their domestication. All the food that reaches our tables is derived from crops that have undergone extensive genetic modification. To illustrate the point, let me cite the history of one of our major staple crops: wheat. The first archaeological evidence of domestication of wheat comes from south-west Asia, in an area called the Fertile Crescent, around 11,000 years ago. The first domesticated wheats — that are grown even today — were pasta types that arose in nature from a cross between two distinct grass species. As human beings migrated with their pasta wheat towards south Asia, the tetraploid wheat picked up the genome of another wild grass species that grew on the southern face of the Caspian Sea, giving rise to the modern bread wheat. Thus, massive genetic modification occurred in the evolution of bread wheat with genes contributed by three grass species.

The list of genetic modifications wheat has undergone since its origin and domestication is too long to be described here, but some recent landmark genetic modifications need to be mentioned. At the end of World War II, the agricultural adviser to the US Occupation Army in Japan realised that breeders in Japan had bred dwarf wheats that possess stiff stems and did not lodge easily. These wheats, called Norins, were taken to Washington State University at Pullman. The dwarfing genes were introduced into the US spring wheats and later into wheats that were bred for Mexico by Norman Borlaug and others. In the 1960s, when India was reeling under famine conditions and living from 'ship to mouth' through PL480 grain from the US, the political establishment in India made the critical decision to introduce dwarf wheats and later disease resistant material in the north, ushering in the green revolution. As long as human civilisation lasts, wheat will keep on undergoing genetic modification. The story of other crops is similar to that of wheat. All the major crops grown globally have undergone massive genetic modifications. The wild potatoes of the Andes, still consumed by some highland tribes, are too full of anti-feedants and too small to be of interest to the modern-day farmer. Without dwarf rice and massive genetic modifications of rice through the mobilisation of genes conferring resistance to pests and pathogens, much of south and east Asia would be in the grip

(continued on page 2 - see CROPS)

Crops - continued from page 1

of famines. The latest development for Africa is Nerica rices produced by combining two distinct species, Asian rice with African rice — another case of massive genetic modification.

Another big lie is that crops with transgenic traits are detrimental to human health and the environment, and are contributing to human misery. Recently, many national newspapers carried news items on Bt cotton. The occasion was 10 years of Bt cotton after its official release in 2002. Most of the headlines were, unfortunately, sensational rather than factual, giving mostly credence to the views and utterances of self-anointed activists and experts and many NGOs who are determined on spreading misinformation and fear regarding the transgenic technologies. An article written by the director of the Central Institute of Cotton research in Nagpur was dubbed as a secret government report even though it is freely available. To quote from the article, "For more than a decade, before 2002, the American bollworm had unleashed terror in cotton fields, by destroying more than 50% of cotton yields in India." "Bt cotton changed the story in India. Yields doubled. Insecticide use was reduced to half of the previous level." The article, however, throws some valid cautionary notes: there are almost 780 hybrids in the market, some of which are susceptible to viral diseases. There is enhanced incidence of sucking pests. Ensuring the longevity of Bt genes, as insects can develop resistance to the Bt protein, is also a major issue. These problems will surely require better management and further genetic modification of the crop.

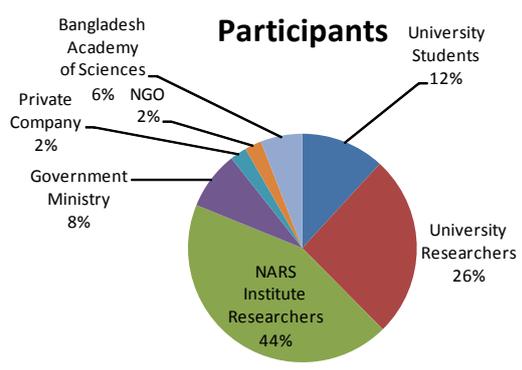
A full-throttled attempt is being made by the anti-GM lobby to relate Bt cotton with farmer suicides. Such statements make interesting headlines but are based on distortions and are, therefore, untenable. A recent NSSO survey shows that 50% farmers are under debt. Can one believe that removal of Bt cotton from the fields will settle farmers' debt problems? Is there a credible model on how cotton farmers can be made debt-free by organic cultivation of cotton? Another big myth — and there are many lies and fetishes woven around it — is organic farming. A recent research paper published in the May 10 issue of the world's leading science journal Nature clearly shows that to feed all the wheat consumers with a crop grown under the organic farming regimes would require 40% more land over and above what is under wheat today. From where will this land come? A more sensible approach would be to introduce benign practices without being dogmatic. India does not have the luxury of rejecting new technologies for agricultural growth. Today, crops with transgenic traits are grown in 160 million hectares of land globally and the area will only increase. It is time we take care of misinformation-based fears by clear enunciation of policies and by conducting research in an open and transparent manner. But the lies need to be nailed and exposed. Both the Union government and the state governments need to stay firm on conducting proper biosafety trials so that necessary data is generated for taking evidence-based judicious decisions on the release and cultivation of crops with transgenic traits. Drift will adversely impact the future of Indian agriculture.

INTERNATIONAL CONFERENCE ON THE ENVIRONMENTAL RISK ASSESSMENT OF GE PLANTS – DHAKA BANGLADESH – IMPRESSIONS FROM THE PARTICIPANTS

Scientists, government officials, and professionals from Bangladesh, Pakistan, India, and elsewhere attended the International Conference on the Environmental Risk Assessment of GE Plants in Dhaka, Bangladesh, from April 15 through 17, 2012. The conference included presentations from a panel of international experts on a variety of topics, including the history of environmental risk assessment (ERA), the harmonization of ERA requirements, the regulation of agricultural biotechnology in South Asia, the status of biotech research in South Asia, weed and insect resistance

management, and regulatory processes as a means to support ERA. The discussion following each session gave the participants the opportunity both to pose questions to the presenters and to share their experiences and challenges with attendees from other countries.

Conference attendees were solicited for their feedback on the usefulness of the presentations and the overall quality of the conference, and feedback was very positive, with an average rating of 4 out of a possible 5. Attendees were also asked for suggestions for improving the conference. The two most frequently mentioned requests were for a case study to be included in the conference and for the conference to be expanded to include time for additional panel discussions and interactive exercises. This will be taken into account in planning for future activities.



Some of the comments are reproduced below:

"It was really very well organized, highly informative, interactive and very relevant conference. I hope the future collaboration regarding above conference will be very beneficial for the ERA of GE plants related R&D activities in Pakistan." ~ University Professor, Pakistan

"I thoroughly enjoyed the conference. Listening to Dr. Raymond Layton, Dr. Joe Smith, Dr. Ariel A. Morales, Dr. Michael Wach, Dr. Martin Gibson and finally you [Dr. Andrew Roberts] was indeed an excellent experience. I enjoyed learning about the problem formulation, evaluation of potential risk and also regulation concerning ERA." ~ University Professor, Bangladesh

"Thanks for organizing such a productive and useful meeting on environmental risk assessment. Both my student, who works with transgenics, and I found it to be most useful. Since our transgenic work is funded by BAS, it is very relevant that BAS agreed to help CERA organize this important workshop/meeting. My congratulations on such an excellently organized meeting." ~ University Professor, Bangladesh



The Reading List

. . . new and notable articles

VIRUS INFECTIONS IN WILD PLANT POPULATIONS ARE BOTH FREQUENT AND OFTEN UNAPPARENT

Prendeville HR, Ye X, Jack Morris T, Pilson D

Premise of the study: Pathogens are thought to regulate host populations. In agricultural crops, virus infection reduces yield. However, in wild plants little is known about the spatial and temporal patterns of virus prevalence. Thus, pathogen effects on plant population dynamics are unclear. Prevalence data provide necessary background for (1) evaluating the effects of virus infection on plant population size and dynamics and (2) improving risk assessment of virus-resistant transgenic crops.

• **Methods:** We used ELISA and RT-PCR to survey wild *Cucurbita pepo* populations over four years for five viruses, aphid-transmitted viruses of the genus *Potyvirus* as a group and PCR to survey for virus-resistance transgenes. In addition, we surveyed the literature for reports of virus prevalence in wild populations.

• **Key results:** In 21 *C. pepo* populations, virus prevalence (0-74%) varied greatly among populations, years, and virus species. In samples analyzed by both ELISA and RT-PCR, RT-PCR detected 6-44% more viruses than did ELISA. Eighty percent of these infections did not cause any visually apparent symptoms. In our samples, the virus-resistance transgene was not present. In 30 published studies, 92 of 146 tested species were infected with virus, and infection rates ranged from 0.01-100%. Most published studies used ELISA, suggesting virus prevalence is higher than reported. • **Conclusions:** In wild *C. pepo*, the demographic effects of virus are likely highly variable in space and time. Further, our literature survey suggests that such variation is probably common across plant species. Our results indicate that risk assessments for virus-resistant transgenic crops should not rely on visual symptoms or ELISA and should include data from multiple populations over multiple years.

AMERICAN JOURNAL OF BOTANY 2012 JUN; 99(6):1033-42. EPUB 2012 MAY 29

BIOTIC STRESS RESISTANCE IN AGRICULTURE THROUGH ANTIMICROBIAL PEPTIDES

Sarika, Iqbal MA, Rai A

Antimicrobial peptides (AMPs) are the hosts' defense molecules against microbial pathogens and gaining extensive research attention worldwide. These have been reported to play vital role of host innate immunity in response to microbial challenges. AMPs can be used as a natural antibiotic as an alternative of their chemical counterpart for protection of plants/animals against diseases. There are a number of sources of AMPs including prokaryotic and eukaryotic organisms and are present, both in vertebrates and invertebrates. AMPs can be classified as cationic or anionic, based on net charges. Large number of databases and tools are available in the public domain which can be used for development of new genetically modified disease resistant varieties/breeds for agricultural production. The results of the biotechnological research as well as genetic engineering related to AMPs have shown high potential for reduction of economic losses of agricultural produce due to pathogens. In this article, an attempt has been made to introduce the role of AMPs in relation to plants and animals. Their functional and structural characteristics have been described in terms of its role in agriculture. Different sources of AMPs and importance of these sources has been reviewed in terms of its availability. This article also reviews the bioinformatics resources including dif-

ferent database tools and algorithms available in public domain. References of promising biotechnology research in relation to AMPs, prospects of AMPs for further development of genetically modified varieties/breeds are highlighted. AMPs are valuable resource for students, researchers, educators and medical and industrial personnel.

PEPTIDES 2012 MAY 29. [EPUB AHEAD OF PRINT]

BT-MAIZE EVENT MON 88017 EXPRESSING CRY3BB1 DOES NOT CAUSE HARM TO NON-TARGET ORGANISMS

Devos Y, De Schrijver A, De Clercq P, Kiss J, Romeis J

This review paper explores whether the cultivation of the genetically modified *Bt*-maize transformation event MON 88017, expressing the insecticidal Cry3Bb1 protein against corn rootworms (Coleoptera: Chrysomelidae), causes adverse effects to non-target organisms (NTOs) and the ecological and anthropocentric functions they provide. Available data do not reveal adverse effects of Cry3Bb1 on various NTOs that are representative of potentially exposed taxonomic and functional groups, confirming that the insecticidal activity of the Cry3Bb1 protein is limited to species belonging to the coleopteran family of Chrysomelidae. The potential risk to non-target chrysomelid larvae ingesting maize MON 88017 pollen deposited on host plants is minimal, as their abundance in maize fields and the likelihood of encountering harmful amounts of pollen in and around maize MON 88017 fields are low. Non-target adult chrysomelids, which may occasionally feed on maize MON 88017 plants, are not expected to be affected due to the low activity of the Cry3Bb1 protein on adults. Impacts on NTOs caused by potential unintended changes in maize MON 88017 are not expected to occur, as no differences in composition, phenotypic characteristics and plant-NTO interactions were observed between maize MON 88017 and its near-isogenic line.

TRANSGENIC RESEARCH 2012 MAY 11. [EPUB AHEAD OF PRINT]

ENHANCING PROTEIN STABILITY WITH RETAINED BIOLOGICAL FUNCTION IN TRANSGENIC PLANTS

Jang IC, Niu QW, Deng S, Zhao P, Chua NH

The final expression level of a transgene-derived protein in transgenic plants depends on transcriptional and post-transcriptional processes. Here, we focused on methods to improve protein stability without comprising biological function. We found that the 4 isoforms of the Arabidopsis RAD23 protein family are relatively stable. The UBA2 domain derived from RAD23a can be used as a portable stabilizing signal to prolong half-life of two unstable transcription factors (TFs), HFR1 and PIF3. Increased stability of the TF-UBA2 fusion protein results in an enhanced phenotype in transgenic plants as compared to expression of the TF alone. Similar results were obtained for the RAD23a UBA1 domain. In addition to UBA1/2 of RAD23a, the UBA domain from the Arabidopsis DDI1 protein also could increase the half-life of the unstable protein JAZ10.1, which is involved in jasmonate signaling. Taken together, our results suggest UBA fusions can be used to increase stability of unstable proteins for basic plant biology research as well as crop improvement.

PLANT JOURNAL 2012 MAY 25 [EPUB AHEAD OF PRINT]

CALENDAR OF EVENTS

Event	Organized by	Date and Venue	Website
INDIA			
Inception Workshop of UNEP/ GEF Supported Phase II Capacity Building Project On Biosafety	Ministry of Environment and Forests	June 18 - 19, 2012 New Delhi	http://moef.nic.in
National Workshop on Biotechnology: Its Applications and Bio-safety Concerns	Shivrath Center of Excellence in Clinical Research (a joint venture with Gujarat State Biotechnology Mission (GSBTM), Department of Science and Technology, Government of Gujarat and Affiliated to Gujarat University)	July 28, 2012 Ahmedabad	
TERI-ITEC Courses 2012-13 Course II - Applications of Biotechnology and its Regulation	The Energy and Resources Institute and Indian Technical and Economic Cooperation (ITEC), Ministry of External Affairs	August 13 - 31, 2012 Gurgaon	http://www.teriin.org/index.php?option=com_events&task=details&sid=505
6th International Congress on Legume Genetics and Genomics	International Crops Research Institute for the Semi-Arid Tropics	October 2 - 7, 2012, Hyderabad	http://www.icrisat.org/gt-bt/VI-ICLGG/homepage.htm
Silver Jubilee International Symposium on "Global Cotton Production Technologies vis-à-vis Climate Change"	Cotton Research and Development Association and CCS Haryana Agricultural University, Hisar	October 10 - 12, 2012 Hisar	http://crdaindia.com/?view=news&page_id=16
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
Third National Symposium on Agriculture Production and Protection in Context of Climate Change	The Society of Agricultural Professionals, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, and Birsa Agricultural University, Kanke, Ranchi	November 3 - 5, 2012 Ranchi	http://www.baujharkhand.org/Downloads/online%20circular%20for%203rd%20national%20symposium.pdf
INTERNATIONAL			
ABIC 2012: The XII International Conference for Agriculture Biotechnology	ABIC Foundation	September 2 - 5, 2012 Rotorua, New Zealand	http://www.abic2012.com/
Commercialization of Biotech Crops: Learning from Asia	Asia BioBusiness Pte. Ltd., the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), and the International Service for the Acquisition of Agri-Biotech Applications (ISAAA)	September 3 - 7, 2012 Los Baños, The Philippines	http://www.asiabiobusiness.com/?page_id=335
12th International Symposium on Biosafety of Genetically Modified Organisms (ISBGMO12)	International Society for Biosafety Research	September 16 - 20, 2012 St Louis, Missouri, USA	http://www.isbgmo.com/
Sixth meeting of the Conference of the Parties serving as the meeting of the Parties to the Cartagena Protocol on Biosafety (MOP-6)	Convention on Biological Diversity (CBD) and MoEF	October 1 - 5, 2012 Hyderabad	http://www.cbd.int/doc/?meeting=MOP-06
Eleventh meeting of the Conference of the Parties to the Convention on Biological Diversity (COP-11)	CBD and MoEF	October 8 - 19, 2012 Hyderabad	http://www.cbd.int/doc/?meeting=cop-11

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