

South Asia Biosafety Program

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BANGLADESH

Frequently Asked Questions: Genetically Engineered Plants and Biosafety

Prof. Dr. Aparna Islam, Brac University

A couple of years back, one of my colleagues and I carried out a study on how the young generation of Bangladesh perceived GE crops and GE food. We found that there were huge concerns about the GE technology and about the safety of organisms that are produced using it. Unavailability of information on this technology in easily understandable language was one of the main reasons for the confusion and misconceptions.

The questions and concerns over any new technology among the public is natural. This is no exception with genetic engineering and GE products. In the 1970s, when recombinant DNA technology was being developed, there were many concerns about it. When the first GE crop was developed, the concerns stretched to the safety of environment and human health from their consumption. In the 1990s, GE crop research began in Bangladesh. In 2013, the country approved the first GE crop for commercial cultivation. The concerns and questions about GE crops and food derived from them were expected.

In recent decades, GE crop development and safety assessment has progressed a lot. Biosafety is now practiced at every step of research and development. Nevertheless, as this research field is quite technical, it may be difficult for people to understand the scientific concepts. This leads to misconception and misinformation about the technology and products derived from it. It is, however, important to have a clear conception to extract the benefits of any technology. Extensive outreach programs for knowledge sharing can be an option to overcome this information gap.

Against this backdrop, we have released the book *Frequently Asked Questions: Genetically Engineered Plants and Biosafety* to address common questions and concerns about GE organisms in an easy and understandable language. Published on March 30, 2021, this is the second publication under the South Asia Biosafety Program's *Biosafety Resource Book Series*.

The book contains basic information, including what is a GE plant, and why and how they are developed is discussed. Examples of GE crops that are grown worldwide and GE crop research and development that are going on in Bangladesh are also listed. In this book, one can find a detailed discussion on various safety concerns about these crops along with how biosafety is evaluated and regulated. Finally, specific issues, like the outcome of genes after eating, effect of antibiotic resistance genes, nutrition of GE food, and long-term health effects of such food items are also addressed.

We have selected the most common concerns and misconceptions that prevail among the public and discussed those through questions and answers.

We have selected the most common concerns and misconceptions that prevail among the public and discussed those through questions and answers. We hope our attempt to explain the GE technology and its biosafety practices will answer many of the apprehensions that exist in peoples' minds.

RESOURCE SPOTLIGHT

BIOSAFETY RESOURCE BOOK SERIES

FREQUENTLY ASKED QUESTIONS

Genetically Engineered Plants and Biosafety



**An electronic version of the book may be
downloaded at:**

**[https://bangladeshbiosafety.org/
biosafety-book/book2/](https://bangladeshbiosafety.org/biosafety-book/book2/)**

Current Status of Bt Cotton Research in Bangladesh

Dr. Md. Kamrul Islam, Senior Scientific Officer & Principal Investigator of Bt Cotton Research, Cotton Development Board



Personnel from the Cotton Development Board, Ministry of Agriculture, Bangladesh at the Bt Cotton Confined Field Trial at the Cotton Research Center, Sreepur, Gazipur (from left to right: Nusrat Jahan, Cotton Development Officer; Dr. Sima Kundu, Insect Pest Specialist; Dr. Md. Kamrul Islam, Senior Scientific Officer; Dr. Alhaz Uddin Ahammed, Executive Director; Md. Akhteruzzaman, Additional Director; and G. M. Farhad Hossain, Cotton Agronomist)

Bangladesh is one of the traditional cotton growing and processing countries in the world, but it faces technology paucity in terms of Bt cotton to increase the productivity. Looking to the high potential of Bt cotton in Bangladesh, the Cotton Development Board (CDB) has taken initiatives for introducing Bt cotton hybrids containing X-gene, which were developed by JK Agro-Genetics Ltd., India. In October 2017, CDB obtained permission from the National Committee on Biosafety (NCB) to carry out contained greenhouse trial with two Bt cotton hybrids, JKCH 1947 Bt and JKCH 1050 Bt.

The contained greenhouse trial was carried out at the Biotechnology Division of the Bangladesh Agricultural Research Institute (BARI) to test the efficacy of Bt cotton hybrids JKCH-1947 Bt and JKCH 1050 Bt along with non-Bt variety CB-9 as a control against cotton bollworm, *Helicoverpa armigera* during March to June 2019. Studies were done by an artificial infestation of second instar larvae of cotton bollworm in the petri dish trials. In this trial, a significant difference was found in Bt and non-Bt cotton on percent leaf infestation at 24h, 48h, 72h, 96h, 120h after larva release. In the case of larval survival, the significantly highest duration of larvae was recorded in non-Bt cotton (31.20 days) and pupae and adults formed. In the case of Bt cotton hybrids, JKCH 1947 Bt and JKCH 1050 Bt, the duration of larvae survival was 5.4 days and 6.2 days, respectively, and pupae did not form.

As the bioassay trial showed that two Bt cotton hybrids, JKCH 1947 Bt and JKCH 1050 Bt were resistant to bollworm, CDB applied for confined field trials to assess the performance of the introduced Bt hybrids in restricted field conditions as per the *Biosafety Guidelines of Bangladesh*.

The results indicated that the two Bt hybrids were better than the non-Bt variety in terms of controlling bollworm and yield potential.

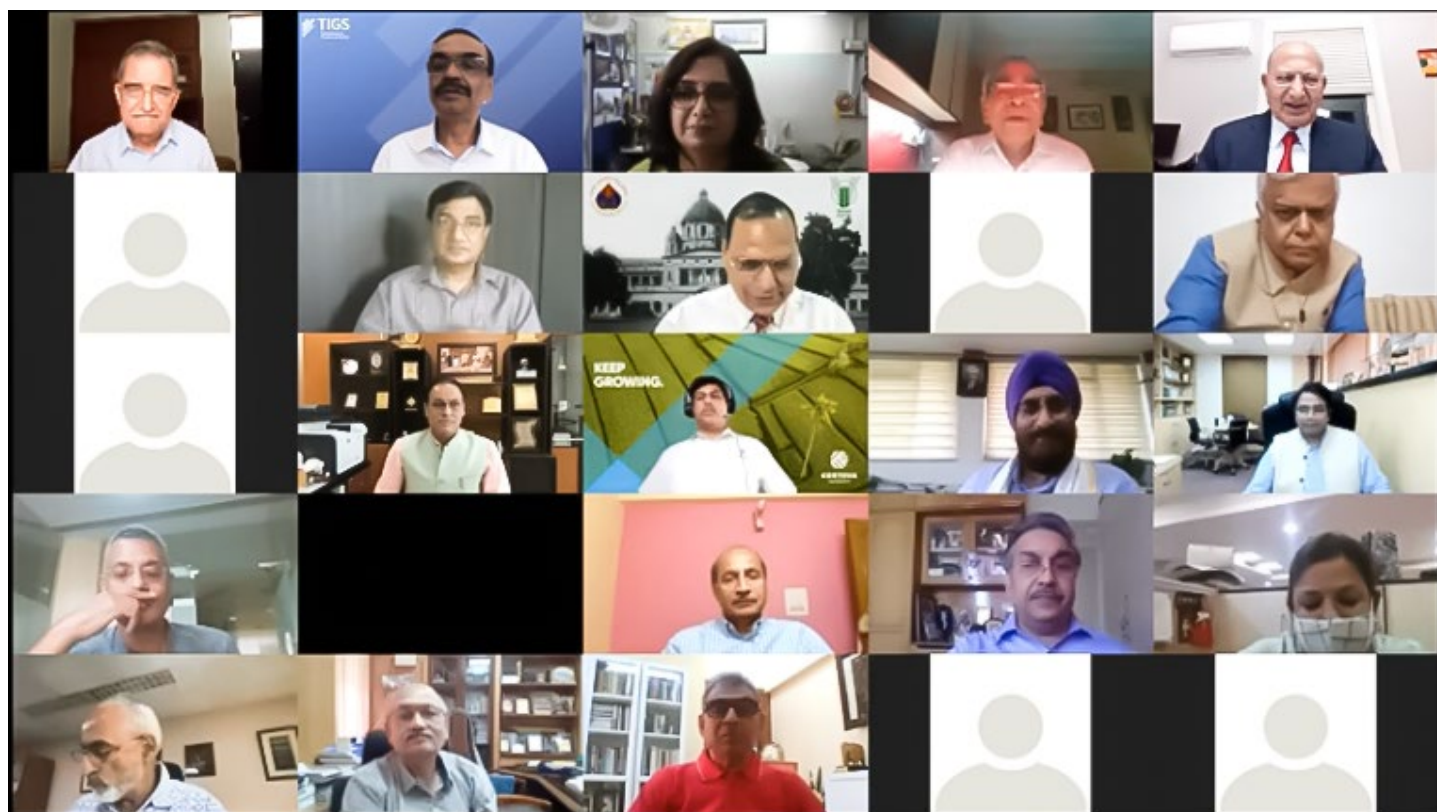
After getting permission from the NCB in March 2020, a confined field trial was carried out at the Cotton Research Center, Sreepur, Gazipur during the 2020-2021 growing season. The experiment was set up in RCBD design with 4 replications. Seeds were sown on the onset of the season. Agronomic characteristics, shoot infestation, and fruit infestation by bollworm were recorded. The average plant height, number of vegetative branches/plant, number of fruiting branches/plant, and number of bolls/plant of JKCH 1947 Bt were 149.3 cm, 0.6, 17.0, and 30.2, respectively. The average plant height, number of vegetative branches/plant, number of fruiting branches/plant, and number of bolls/plant of JKCH 1050 Bt were 131.7 cm, 1.2, 15.7, and 31.7, respectively. The average plant height, number of vegetative branches/plant, number of fruiting branches/plant, and number of bolls/plant of CB-9 were 120 cm, 1.3, 14.6, and 10.3, respectively after 140 days of sowing.

The percent shoot infestation due to the attack of bollworm was 0.02, 0.00, and 11.3 in the JKCH 1050 Bt, JKCH 1947 Bt, and CB-9, respectively. The percent boll infestation due to the attack of bollworm was 1.02, 0.07, and 50.9 in the JKCH 1050 Bt, JKCH 1947 Bt, and CB-9, respectively, after 140 days of sowing. The seed cotton yield of JKCH 1947 Bt, JKCH 1050 Bt, and CB-9 were 3.41, 3.47, and 1.92 t/ha, respectively. The results indicated that the two Bt hybrids were better than the non-Bt variety in terms of controlling bollworm and yield potential.

Currently, CDB has applied for permission from the NCB to conduct multi-location trials to assess the performance of Bt hybrids under different agro-ecological conditions of Bangladesh as per the *Biosafety Guidelines of Bangladesh*. The CDB has taken necessary steps to initiate multi-location trials during the 2021-2022 cotton growing season.

Stakeholders Dialogue on Enabling Policies for Harnessing the Potential of Genome Editing in Crop Improvement

Dr. Vibha Ahuja, Biotech Consortium India Limited



Participants and speakers at the Stakeholders Dialogue on Enabling Policies for Harnessing the Potential of Genome Editing in Crop Improvement (March 17, 2021).

A Stakeholders Dialogue on Enabling Policies for Harnessing the Potential of Genome Editing in Crop Improvement was organized jointly by Trust for Advancement in Agricultural Sciences (TAAS), a neutral think tank in collaboration with the Indian Council of Agricultural Research (ICAR), National Academy of Agricultural Sciences (NAAS), Biotech Consortium India Limited (BCIL), Tata Institute for Genetics and Society (TIGS), National Agri-Food Biotechnology Institute (NABI), and Biotechnology Industry Research Assistance Council (BIRAC) on March 17, 2021. The stakeholder dialogue was chaired by Padma Bhushan Dr. R.S. Paroda, TAAS Chairman, Former Secretary, DARE and DG, ICAR. The deliberations of the stakeholders dialogue included an opening session, three presentations, and a panel discussion by eminent national experts in the field. The webinar was attended by more than 70 participants representing a cross section of stakeholders including scientists, policymakers, regulators, and industry.

Dr. Renu Swarup, Secretary, DBT stressed the need for an enabling eco-system to take forward applications of gene editing, with a focus on capacity building for both human and infrastructure.

In his opening remarks, Dr. R.S. Paroda spoke about the need for innovative technologies in agriculture to meet the challenges of achieving Sustainable Development Goals (SDGs), particularly SDG 1—to end poverty in all its forms everywhere and SDG 2—to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. He spoke about development of CRISPR/Cas technology and its rapid adoption at the global level as a tool to deal with the above challenges. He stressed the need for streamlining the regulatory requirements for gene editing and issues related intellectual property rights (IPR) of the CRISPR/Cas technology through public private partnerships (PPP) for using gene editing technology for the benefit of farmers.

Dr. Rakesh Mishra, Director, CSIR-Centre for Cellular and Molecular Biology and Chairman, Review Committee on Genetic Manipulation spoke about how developments in genome sequencing and availability of large information sets are helping targeted research and develop-



Speakers at the Stakeholders Dialogue (from left to right): Dr. R.S. Paroda, Dr. Rakesh Mishra, Dr. Renu Swarup, and Dr. T. Mohapatra (March 17, 2021).

ment. He opined that the regulatory system must be responsive to the advances in technology and innovation, and regulatory requirements should be commensurate to the technology requirements.

Dr. Renu Swarup, Secretary, DBT stressed the need for an enabling eco-system to take forward applications of gene editing, with a focus on capacity building for both human and infrastructure, skill enhancement through the exchange of knowledge at national and international levels, and streamlining the regulatory system. She informed attendees that DBT has prepared draft guidelines, which are under consideration by the Genetic Engineering Advisory Committee, and efforts are being made to expedite the adoption of the guidelines.

Dr. T. Mohapatra, Secretary, DARE and DG, ICAR indicated that the regulatory aspects for gene editing should be dealt with a product-oriented approach and the guidelines be approved at the earliest. Regarding IPR issues for genome edited plants, he suggested the need for collaborations and partnership. He opined that beyond the scientific

considerations, there is an urgent need to generate awareness among administrative and policymakers about the technology.

Three presentations were made on research and development, regulatory, and IP aspects of genome editing by Dr. C. Viswanathan from the Indian Agricultural Research Institute, Dr. K.V. Prabhu, Chairperson, Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA), and Dr. Amitabh Mohanty from Corteva Agriscience.

Eminent experts from academia, industry, research institutions, and other stakeholder groups shared their views in the panel discussion moderated by Dr. T.R. Sharma, Deputy Director General (Crop Science), ICAR.

VIDEO

A recording of the event is available at:
<https://www.dropbox.com/s/vpzvjlwxvylqc41/Stakeholders%20meeting%20Tass.mp4>

BANGLADESH

Virtual Workshop on Writing Pre-Proposals for the Biosafety Research in Bangladesh Grants Program (BRBGP)-2021

Sium Ahmed, Biosafety Support Officer, South Asia Biosafety Program

The Biosafety Research in Bangladesh Grants Program (BRBGP) is a competitive grants program to support research projects designed to improve understanding of the interactions between genetically engineered crops, agricultural production, and the environment in Bangladesh, as it relates to environmental risk assessment and the conservation of biodiversity. Managed by the Agriculture & Food Systems Institute (AFSI) as part of the USAID-funded South Asia Biosafety Program (SABP), the BRBGP is currently continuing its third phase.

To encourage potential researchers and to share information and requirements on writing pre-proposals for the grants program, SABP organized a virtual workshop entitled "Writing Pre-Proposals for the Biosafety Research in Bangladesh Grants Program (BRBGP)-2021" on March 6, 2021. The objectives of the workshop were to discuss the overall context of the grants program, with emphasis on research areas, the grant application and selection process, the intended outcome, and how it would recognize the need for biosafety research as part of a broader effort to support science-based decision-making and policy development. A total of 48 researchers from different organizations including National Agricultural Research Systems, public universities, and private research institutes participated in the workshop.

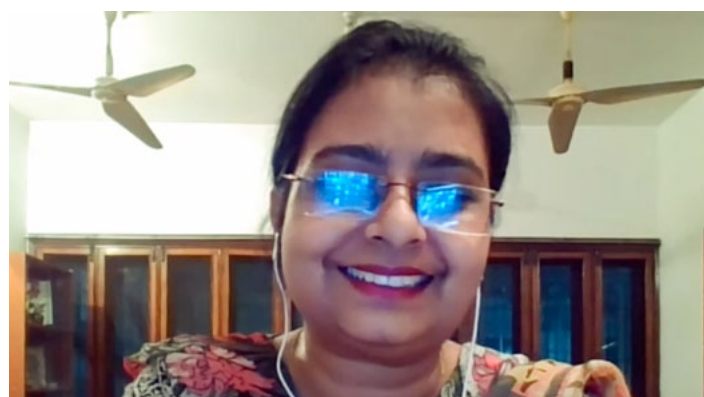
The workshop started with the welcome address from Dr. Andrew F. Roberts, Chief Executive Officer, Agriculture & Food Systems Institute (AFSI). After that, 15 years of the journey of SABP was highlighted by Prof. Dr. Aparna Islam, Brac University. The core presentation was done

by Dr. Roberts, which included introducing the participants to the BRBGP-2021 and the session on writing the pre-proposals for the grants program.

The primary part of the talk focused on the purpose of the program, funding information, research support areas, application criteria, and requirements. Then, Dr. Roberts summarized the pre-proposal process and the requirements for writing a good pre-proposal. He also mentioned some useful points that would increase the chances in the competition. Dr. Roberts ended his presentation by giving a glimpse of the reasons behind the failure of some proposals.

A question-and-answer session followed the session on writing the pre-proposals. This session was moderated by Dr. Roberts. Discussions centered around the timeframe of the grant program, possibility of extensions, number of awards, and criteria for international collaboration. Dr. Roberts answered all the questions and provided clarification on the concerns that participants had. Dr. Roberts gave clear and concise descriptions of the scope, objectives, and intended outcomes expected of the grant recipients. During the question-and-answer session, suggestions were provided by the participants with a view toward enriching the grants program in the future. Participants found the workshop and the discussion very useful and expressed that the information provided will help them in preparing impactful pre-proposals for the BRBGP-2021.

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Dr. Andrew F. Roberts and Prof. Dr. Aparna Islam at the Virtual Workshop on Writing Pre-Proposals for the BRBGP-2021 (March 6, 2021)

CALENDAR OF EVENTS

EVENT	ORGANIZED BY	DATE	WEBSITE
INDIA			
ICGEB-DBT Workshop: Re-Designing Smart Crops for Sustainable Agriculture – Dynamics of CRISPR-Cas Breeding, NGS, and Beyond	International Centre for Genetic Engineering and Biotechnology (ICGEB) and the Department of Biotechnology	April 26-30, 2021 Virtual	https://www.icgeb.org/re-designing-smart-crops-for-sustainable-agriculture-workshop-2021/
National Symposium on Plant Health Management Beyond 2020	Himalayan Phytopathological Society and the Department of Plant Pathology, Dr. YS Parmar University of Horticulture & Forestry	May 5-6, 2021 Solan (HP)	http://www.yspuniversity.ac.in/mpp/hpsociety/NSHPS_Brochure.pdf
International Conference on Sugarcane Research	ICAR-Sugarcane Breeding Institute, Tamil Nadu Agricultural University, and the Society for Sugarcane Research and Development	June 19-22, 2021 Coimbatore	https://sugarcane.icar.gov.in/images/sbi/Canecon_2020/cancon_second_circular.pdf https://tnau.ac.in/wp-content/uploads/2020/10/1601938688.pdf
International Horticulture Conference – Next Generation Horticulture (NEXTGEN – HORT)	Tamil Nadu Agricultural University	September 16-19, 2021 Tamil Nadu	https://tnau.ac.in/news-events/
INTERNATIONAL			
7 th Plant Genomics and Gene Editing Congress: Asia	Global Engage Ltd.	April 20-21, 2021 Virtual	http://www.global-engage.com/event/plant-genomics-asia/
Webinar on Countering the Illicit Transfer of Intellectual Property by Promoting Knowledge and Information Security Best Practices	Sandia National Laboratories (SNL), USA	April 29, 2021 Virtual	https://gcbs-events.sandia.gov/
Hands-on Course: CRISPR/Cas9 Genome Editing: A New Approach for Therapeutics	ICGEB	September 6-8, 2021 Cairo, Egypt	https://www.icgeb.org/activities/meeting-and-courses/
Workshop: Genome Editing to Generate Cellular and Animal Models of Human Diseases	ICGEB	September 7-10, 2021 Cape Town, South Africa	https://www.icgeb.org/activities/meeting-and-courses/
Workshop: Fall Armyworm Control - Challenges and Opportunities for the Use of Biopesticides	ICGEB	November 16-18, 2021 Cape Town, South Africa	https://www.icgeb.org/activities/meeting-and-courses/



SOUTH ASIA
BIOSAFETY PROGRAM

The South Asia Biosafety Program (SABP) is an international development program implemented in India and Bangladesh with support from the United States Agency for International Development (USAID). SABP aims to work with national governmental agencies and other public sector partners 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.



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