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South Asia Biosafety Program

BANGLADESH

Biotechnology Outreach Conference

Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP

Guests at the Inaugural Session of the Biotechnology Outreach Conference (from left): Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP; Dr. Shaikh Mohammad Bokhtiar, Executive Chairman, BARC; Dr. Md. Ruhul Amin Talukder, Additional Secretary (PPC), Ministry of Agriculture, Bangladesh; Megan Francic, Agricultural Attaché, Foreign Agricultural Service, USDA; and Dr. Andrew F. Roberts, CEO, AFSI (June 14, 2022).

The Agriculture & Food Systems Institute (AFSI), in collaboration with Biotech Consortium India Limited (BCIL) and the United States Department of Agriculture (USDA), organized a two-day outreach event entitled "Biotechnology Outreach Conference" under the auspices of the South Asia Biosafety Program (SABP) on June 14-15, 2022 at The Westin, Dhaka.

This conference was primarily a "biotechnology information exchange event," and it served as a forum for reaching out to various stakeholders in Bangladesh, including government officials, academics, researchers, the commercial sector, and other interested parties.

There were 117 participants in total from several national research institutions, academics from various public and private universities, private research groups, and representatives from the government, including policymakers.

This conference comprised a variety of plenary sessions, as well as panel discussions where various aspects of contemporary biotechnology were discussed, including the most recent data on research and development in Bangladesh. The status of regulation and trading in contemporary biotechnology products and science communication related to biotechnology were also discussed.

The two-day event was deemed to have been a great success. There were 117 participants in total from several national research institutions, academics from various public and private universities, private research groups, and representatives from the government, including policymakers.

Continued on page 2

Continued from page 1

DAY 1: JUNE 14, 2022, THE WESTIN, DHAKA

The event started with the registration of the participants.

Inaugural Session

The Chief Guest for the Inaugural Session was Dr. Md. Ruhul Amin Talukder, Additional Secretary (PPC), Ministry of Agriculture, Government of the People's Republic of Bangladesh. As special guests for this opening session, Dr. Shaikh Mohammad Bokhtiar, Executive Chairman of the Bangladesh Agricultural Research Council (BARC), and Megan Francic, Agricultural Attaché of the Foreign Agricultural Service, United States Department of Agriculture (USDA), were present.

In this session, the welcome address was delivered by Professor Dr. Rakha Hari Sarker, Country Coordinator for SABP, and the vote of thanks was offered by Dr. Andrew F. Roberts, Chief Executive Officer of AFSI.

Dr. Smyth clearly demonstrated the worldwide benefits of modern agricultural biotechnology, especially the products developed through the applications of various advanced biotechnological methods globally.

Session 1: Agriculture and Technology

There were three deliberations for this session. The presenters of this session were: Prof. Dr. Md. Shahidul Haque, Department of Biotechnology, Bangladesh Agricultural University, Mymensingh, Dr. Swapan Datta, Former Deputy Director General (Crop Science), Indian Council of Agricultural Research, and Dr. Stuart Smyth, Associate Professor, University of Saskatchewan, Canada.

The title of the paper of Prof. Dr. Haque was "Modern Agricultural Challenges". In his presentation, he elaborately discussed the challenges facing agriculture in Bangladesh at present.

The title of the presentation of Dr. Datta was "Agriculture and Innovation". Dr. Datta elaborately discussed the solutions that modern biotechnology could provide to overcome the challenges to agriculture, particularly in developing countries. He also emphasized the requirement of innovations related to modern biotechnology, especially the advantages of technologies like genome editing.

The title of the presentation by Dr. Smyth was "Global Status of Biotechnology." In his deliberation, Dr. Smyth clearly demonstrated the worldwide benefits of modern agricultural biotechnology, especially the products developed through the applications of various advanced biotechnological methods globally. He also indicated the importance of innovation in obtaining the advantages of modern biotechnology.

Session 2: Biotechnology Developments in Bangladesh

Three presenters of this session included Dr. Md. Abdullah Yousuf Akhond, Chief Scientific Officer and Head, Biotechnology Division, Bangladesh Agricultural Research Institute (BARI), Dr. Md. Kamrul Islam, Senior Scientific Officer, Cotton Development Board (CDB), and Mr. Mohammed Solaiman Haider, Director (Planning) Department of Environment (DoE).

Dr. Akhond presented various biotechnological research activities of the Bangladesh Agricultural Research Institute (BARI). Particularly, he described the context of the development and commercial release of Bt eggplant, as well as the present status of cultivation of these products. He also elaborately discussed the collaborative transgenic research for the development of late blight resistance in potatoes. His presentation included other ongoing research activities at BARI.

Dr. Islam presented the current status of research, as well as the ongoing trials of two hybrid varieties of Bt cotton by CDB. He explained the steps and SOPs followed during the confined field trials of these materials.

Mr. Haider presented on the "Biotechnology Regulatory Regime in Bangladesh." In his lecture, he described the various biosafety documents developed by the Government of Bangladesh, such as the Biosafety Guidelines, Biosafety Framework, Biosafety Rules, etc. He also explained the different committees and their functions related to biosafety regulation in Bangladesh.

DAY 2: JUNE 15, 2022, THE WESTIN, DHAKA

Session 3: Regulation of Biotechnology in Bangladesh

There were four deliberations during this session. The presenters of this session were: Dr. Andrew F. Roberts, CEO, AFSI, Dr. Md. Abdul Kader, Principal Scientific Officer, Plant Breeding Division, Bangladesh Rice Research Institute (BRRI), Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP, and Dr. Bhavneet Bajaj, Manager-Scientific Programs, AFSI.

Dr. Roberts presented the "Global Context and Current Regulatory Status". In his presentation, he elaborated on the present scenario of globally accepted biotech products used in both developed and developing nations and especially, the trade of GE products with high economic value. Dr. Roberts also highlighted the regulatory status for products of modern biotechnology in Bangladesh. He pointed out that to get benefits from biotechnological products, the present biosafety system should be properly resourced and dedicated biosafety staff is required for handling the biosafety issues properly. He also reported on the various biosafety related activities currently operated by SABP in Bangladesh.

Dr. Stuart Smyth presenting on the Global Status of Biotechnology during the first session of the conference entitled Agriculture and Technology (June 14, 2022).

Continued on page 3

Continued from page 2

Mr. Mohammed Solaiman Haider answering questions during the panel discussion of the second session of the conference (from left): Mr. Mohammed Solaiman Haider, Director (Planning), Department of Environment; Dr. Md. Abdullah Yousuf Akhond, CSO and Head, Biotechnology Division, BARI; Dr. Md. Kamrul Islam, SSO, CDB; and Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP (June 14, 2022)

Dr. Kader presented the various biotechnological research activities and initiatives of BRRI towards the development of GE products. He mentioned that BRRI has been involved in research for the development of stress tolerance in rice varieties, as well as the varieties to address micronutrient deficiencies. He especially highlighted the ongoing biosafety-related activities with Golden Rice. He also presented an update on the status of high iron and zinc rice research at BRRI.

Prof. Dr. Sarker presented various resources for biosafety in Bangladesh, particularly various SABP activities related to biotechnology and biosafety in Bangladesh since 2005. He pointed out the current Institutional Biosafety Officer Training Program and different workshops with the Bangladesh Food Safety Authority (BFSA) organized by SABP. Further, the activities of SABP with the National Institute of Biotechnology (NIB) and Bangladesh Academy of Sciences (BAS) were discussed. He also highlighted the Bangladesh Biosafety Portal, the only consolidated repository of documents about biosafety regulation in Bangladesh and different resource books developed by SABP.

Dr. Roberts [...] pointed out that to get benefits from biotechnological products, the present biosafety system should be properly resourced and dedicated biosafety staff is required.

Dr. Bajaj presented the progress made by another USDA-funded project under SABP, the South Asia Harmonization Initiative. Work has been done in this project around a harmonization approach for the safety assessment of foods derived from GE crops in South Asia. She pointed out that a sound scientific system is fundamental to regulatory harmonization. Experts from four countries participating in this project, Bangladesh, Bhutan, India, and Sri Lanka, have drafted a consensus document titled *Towards a Harmonised Approach to Food Safety Assessment of Genetically Engineered Plants in South Asia,* which is based on commonalities in the national guidelines, as well as the internationally recognized codex guideline.

Session 4: Biotechnology for Animal Feed

In this session, there were four presentations. The presenters of this session were: Dr. A.B.M. Khaleduzzaman, Director, BCS Livestock Academy, Department of Livestock Services (DLS), Mr. Md. Zahidul Islam, CEO, UK-Bangla Feed, Dr. Bhavneet Bajaj, Manager- Scientific Programs, AFSI, and Ms. Rosalind Leek, Senior Director, Market Access, US Soybean Export Council.

Dr. Khaleduzzaman presented on "Animal Feed: Status and Policy in Bangladesh." He described the livestock development and national contribution, policy issues in livestock development, commercial feed industry, and future demand. He also presented the present status of animal feed price in Bangladesh compared to the world feed price. Moreover, he discussed the prospects of applying biotechnology in the feed manufacturing industry for the future.

Mr. Islam presented on "Requirements of Animal Feed and Trade in Bangladesh." He elaborated on the present status of poultry, livestock, and fish production and requirements of healthy feed for this fastest-growing agricultural sub-sector in Bangladesh. He emphasized the research for the development of nutrition-rich healthy feed for animals, particularly for the production of cost-effective and safety feed formulation for animals in Bangladesh.

Dr. Bajaj presented on "GM Crops and Derivatives for Animal Nutrition." After that, a very informative video deliberation of Ms. Rosalind Leek on "Trade, Biotechnology, and Animal Feed" was presented, which was appreciated by the participants. Following these presentations, an interactive panel discussion was held.

Session 5: Science Communication - Biotechnology, Science, and Society

There were two presentations in this final session of the Biotechnology Outreach Conference. The presenters of this session were Mr. Reaz Ahmad, Executive Editor, *Dhaka Tribune* and Dr. Haseena Khan, Professor, University of Dhaka and Secretary, Bangladesh Academy of Sciences.

Mr. Ahmad presented on "Science Communication." In particular, he described the challenges in communicating science in Bangladesh. He also discussed the role of journalists in developing modern science-based products for society and highlighted the ongoing high value biotech research at different research institutes in Bangladesh.

Continued on page 4

Continued from page 3

Discussants at the panel discussion of the third session on Regulation of Biotechnology in Bangladesh (from left): Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP; Dr. Bhavneet Bajaj, Manager-Scientific Programs, AFSI; Dr. Aparna Islam, Professor, Brac University; Dr. Andrew F. Roberts, CEO, AFSI; and Dr. Md. Abdul Kader, PSO, Plant Breeding Division, BRRI (June 15, 2022).

He also explained his experience in communicating science as a senior journalist.

Finally, Dr. Khan discussed the "Role of Bangladesh Academy of Sciences in Science Communication." Dr. Khan explained the various activities of BAS to support the biotechnological research in Bangladesh, particularly in the field of agriculture. Apart from these, Dr. Khan described the future strategy of the academy in scientific activities and science communication in Bangladesh.

At the end of each session, a panel discussion was held. The discussions during those sessions were very interactive and relevant to the status and further progress of biotechnology research and regulation in Bangladesh

INDIA

Indian Scientist Dr. Parveen Chhuneja Conferred Women in Triticum (WIT) Mentor Award 2022 by Borlaug Global Rust Initiative

Dr. Vibha Ahuja, Biotech Consortium India, Limited

Dr. (Mrs.) Parveen Chhuneja, Director, School of Agricultural Biotechnology, Punjab Agricultural University (PAU), Ludhiana, India was conferred the Jeanie Borlaug Laube Women in Triticum (WIT) Mentor award for the year 2022 by the Borlaug Global Rust Initiative (BGRI) in recognition of her outstanding work mentoring the next generation of wheat experts, especially young women scientists. The award has been institutionalized in the name of Jeanie Borlaug Laube, daughter of Nobel Prize-winner, Norman E. Borlaug. The WIT Mentor Award recognizes the efforts of men and women at the international level who have played a significant role in shaping the careers of women working in wheat and demonstrated a commitment to increasing gender parity in agriculture. For the first time, this prestigious international award went to India. Dr. Chhuneja has been working on identification and introgression of novel genetic variation from wild wheat species into cultivated wheat, leading to wheat gene pool enrichment. Dr. Chhuneja, along with her team, has successfully introgressed a series of genes for disease resistance, quality, and productivity traits from wild *Aegilops* and *Triticum* species into elite wheat backgrounds. Wheat varieties with rust resistance genes *Lr57-Yr40* and *Lr76-Yr70*, introgressed by her group, are being cultivated in farmers' fields in India. Dr Chhuneja has mentored more than 30 young women researchers, a number of whom are working at national and international institutes

Since founding the WIT awards in 2010, the BGRI has recognized 66 early career award winners and 12 mentors from 27 different countries. However, this is the first time that the WIT Mentor Award has been conferred to an Indian Scientist.

Previously, Dr. Chhuneja was bestowed the Panjabrao Deshmukh Outstanding Woman Scientist Award by the Indian Council of Agricultural Research (ICAR) and Society for Advancement of Wheat and Barley Research, Dr. Gurdev Singh Khush Distinguished Professor Award by the PAU, and International Gene Stewardship Team Award by BGRI, in recognition of her outstanding contributions in wheat research and development. Dr. Chhuneja was also bestowed fellowships from two prestigious national science academies of India, the NASI & NAAS.

More information:
bgri.cornell.edu/2022-women-in-triticum-award-winners/

The Fourth Workshop of the Institutional Biosafety Officer Training Program

Dr. Md. Zakir Hossain, Principal Scientific Officer, Bangladesh Jute Research Institute

Participants and the guests during the inaugural session of Fourth Workshop of the Institutional Biosafety Officer Training Program (June 8, 2022).

The Fourth Workshop of the Institutional Biosafety Officer (IBO) Training Program was held on June 8-9, 2022, at BCDM Rajendrapur, Gazipur, Bangladesh, with twenty participants from the National Agricultural Research Institutes, the National Institute of Biotechnology (NIB), and universities. The workshop was organized by the Agriculture & Food systems Institute (AFSI), under the auspices of the South Asia Biosafety Program (SABP), in collaboration with Biotech Consortium India Limited (BCIL) and the Ministry of Agriculture, Government of the People's Republic of Bangladesh.

Dr. Rakha Hari Sarker, Country Coordinator, SABP and Professor, University of Dhaka, welcomed all the participants and delivered an overview of the two-day workshop. Dr. Andrew Roberts, Chief Executive Officer, AFSI, provided a recap of the previous workshops held in the series. Dr. Aparna Islam, Professor, Brac University, provided a short presentation on "Biosafety Regulations for Confined Field Trials (CFTs) of GE Plants in Bangladesh." In the inaugural address, Dr. Debasish Sarker, Director General, Bangladesh Agricultural Research Institute (BARI), shared the vital provision of the biosafety regulatory framework that is followed by BARI researchers, especially for Bt Brinjal. Another guest of honor, Dr. Md. Shahjahan Kabir, Director General of the Bangladesh Rice Research Institute (BRRI), shared his opinion on various biosafety issues related to the development of Golden Rice at BRRI. He also addressed the difference between the regulatory process and policies of different countries and regions in his speech. He encouraged the efforts of SABP, BCIL, and AFSI for carrying out activities to ensure proper biosafety in South Asia. Dr. Vibha Ahuja, Chief General Manager, BCIL and Senior Advisor, SABP, provided the Vote of Thanks in the Inaugural Session.

Following the Inaugural Session, Dr. Roberts delivered a presentation on "Understanding Requirements for Risk Assessment and Management in the Context of CFTs of GM Plants," where he explained CFTs in the context of risk analysis and how it is essentially a risk management plan. He also discussed the planning and management of CFTs. Some group exercises were conducted by Dr. Roberts during his presentation regarding the confinement measures.

At the end of the presentation and group exercise, Dr. Vibha Ahuja presented "Using Plant Biology Documents and Conduct of CFTs." She presented some key considerations while planning CFTs and elaborated on confinement, reproductive isolation, consensus documents, and trial designs. A group exercise on "Risk Management in Planning CFTs" was conducted following the presentation. All attendees actively participated to provide information in light of biology documents by OECD and shared their different views on crop characteristics, confinement challenges, management, reproductive isolation, harvest and disposition, and post-harvest restrictions on the given crop for the group exercise.

All attendees [...] shared their different views on crop characteristics, confinement challenges, management, reproductive isolation, harvest and disposition, and post-harvest restrictions.

Prof. Dr. Rakha Hari Sarker presented on "Application for CFTs: Requirements and Process of Review in Bangladesh." He talked about the CFTs, their necessities, existing policies, and the regulatory processes for applications. Dr. Md. Abdul Kader, Principal Scientific Officer, Plant Breeding Division, BRRI shared his experience on the approval and conduct of CFTs.

Following Dr. Kader's presentation, Dr. Bhavneet Bajaj, Manager, Scientific Programs, AFSI delivered a presentation on "SOP for Conduct of a CFT: Handling Material, Maintaining Isolation, Harvest and Termination, Documentation." She discussed in detail all the SOPs pertaining to the conduct of CFTs that have been approved by the National Committee on Biosafety in Bangladesh. Dr. Aparna Islam specifically talked about "Guidance on Preparation of Crop Specific SOPs," during which she rightly mentioned how proper SOPs would be helpful for researchers.

The session on Day 2 started with Dr. Roberts' presentation on "Recording Formats for Compliance with Regulatory Requirements." He discussed the available recording formats and why record keeping is important for demonstrating compliance.

Dr. Vibha Ahuja then delivered a talk on "Field Trial Monitoring and Inspection by Regulatory Authorities" and explained the importance of monitoring trial sites. She also gave some examples of proformas that may help in the process.

Dr. Mohammad Kamrul Hasan, Senior Scientific Officer, Biotechnology Division, BARI spoke next, sharing his experience regarding Bt Brinjal. Specifically, he showed the institutional liabilities and the biosafety measures that were being followed during Bt Brinjal release, as well as the post-release portfolio. The final presentations were delivered

Continued on page 6

Continued from page 5

Participants during the second day of the Fourth Workshop of the IBO Training Program (June 9, 2022).

by Dr. Ahuja, who first talked about "Non-Compliance and Corrective Action," highlighting the appropriate corrective actions and some examples. She then presented on the "Preparation of Field Trial Report," which made the participants confident to prepare a report regarding ensuring the integrity of GE products.

Finally, the ask anything session covered all the topics discussed during the two-day event. Several participants shared their views, opinions, and future activities, which will be beneficial for fulfilling workshop objectives. All the scientists showed their integrity to work closely with their stakeholders by ensuring biosafety while working. They emphasized building a community so that everyone can mutually benefit.

INDIA

Hands-on Laboratory Training on Detection of Genetically Modified Organisms/Living Modified Organisms Organized by BCIL and Export Inspection Agency-Kochi, India, As Part of a Capacity Building Initiative by FAO-Sri Lanka

Dr. Anoop A. Krishnan and Dr. Vinay Kumar, Export Inspection Agency, Kochi

The Hands-on Laboratory Training on Detection of Genetically Modified Organisms (GMO)/Living Modified Organisms (LMO) was held from June 13-16, 2022 at the Export Inspection Agency (EIA)-Kochi, India. The training program was organized by Biotech Consortium India Limited (BCIL) and EIA-Kochi as part of a capacity building initiative of the Food and Agricultural Organization (FAO)-Sri Lanka. Fifteen participants from various organizations in Sri Lanka, including the Agricultural Biotechnology Centre (AgBC), Industrial Technology Institute (ITI), National Plan

Participants of the Hands-on Laboratory Training on Detection of Genetically Modified Organisms/Living Modified Organisms at EIA-Kochi (June 13-16, 2022)

Continued on page 3

Continued from page 6

Quarantine Service (NPQS), Sri Lanka Accreditation Board (SLAB), and Central Environmental Authority (CEA) participated in the program.

As part of the opening session, Shri. Ravi Shankar, Joint Director, EIA-Kochi cordially welcomed all the participants and outlined the importance of the second phase of the program supplementing the virtual training organized in October 2021. The training session was inaugurated with a "lighting of the lamp" by EIA officials, resource persons, and Sri Lankan participants. This was followed by an introduction of all the participants. Dr. J.S. Reddy, Additional Director, Export Inspection Council, gave the keynote address virtually. He explained activities of the EIC and molecular biology lab at EIA-Kochi. He expressed his appreciation of scientists at EIA-Kochi for maintaining a state-of-the-art molecular biology lab and their involvement in LMO detection. He stressed the importance of such a hands-on capacity building program on GMOs/LMOs. Dr. Vibha Ahuja, Chief General Manager, BCIL discussed the objective of the program. Prof. Pradeepa Bandaranayake, Director, AgBC gave an overview on the biosafety project and its implementation in Sri Lanka. Dr. Lalitha Gowda, Expert Consultant, LMO Detection for Sri Lanka Biosafety Project, detailed the structure of the four-day training program. The opening session concluded with the vote of thanks by Dr. Anoop A Krishnan, Assistant Director, EIA-Kochi.

The training program concluded with feedback from participants from Sri Lanka wherein they expressed their appreciation for the training sessions [...] which would help them to implement the same in Sri Lanka.

The participants were given an overview on the activities of the EIA-Kochi laboratory through a tour of all the sections. The technical session began with a recap of the Virtual Training Session on Detection of GMOs/LMOs held on October 4-8, 2021 by Dr. Lalitha Gowda. Presentations were made by different organizations from Sri Lanka on the learnings in the first phase of the training at respective laboratories.

On June 14, 2022, the second day of the technical session, Dr. Lijo John, Assistant Director, EIA-Kochi gave an overview of using PCR for the detection of GMOs/LMOs. The participants were divided into three groups of five, each coordinated by Dr. Lalitha Gowda, Dr. Lijo John, and Dr. Vinay Kumar and were given the opportunity to prepare samples, process them by sample homogenization, extract DNA, run PCR, and interpret the results.

On June 15, 2022, the participants were taken for a field trip to two commercial GMO testing labs, M/s Interfield laboratories, Kochi and M/s Neogen Food & Animal Security (India) Pvt. Ltd, Kochi. In these laboratories, the participants were briefed about the process of GMO testing, as well as maintenance of documents and records as per ISO/IEC 17025:2017. In one of the laboratories, a demonstration of rapid kits involved in GMO detection was provided.

On June 16, 2022, a presentation on validation and verification methodologies/technologies used for GMO analysis was given by Dr. Lalitha Gowda, followed by an interactive walk through of information sources on GMO/LMO detection by Dr. Lijo John. The faculty noted that the participants were very enthusiastic throughout the training and took an active role in discussions during the training. The key highlight of the training was the practical hands-on exposure to participants on GMO/LMO testing. The training program concluded with feedback from participants from Sri Lanka wherein they expressed their appreciation for the training sessions and also thanked EIA and BCIL for the practical hands-on sessions, which would help them to implement the same in Sri Lanka. Certificates of participation were given to all the participants.

For more information, contact: eia-kochilab@eicindia.gov.in

Visit to Interfield Laboratories, Kochi, India (June 15, 2022).

Visit to Neogen Food & Security (India) Pvt. Ltd, Kochi, India (June 15, 2022).

Tour of the facilities at EIA-Kochi (June 13, 2022).

Hands on demonstration of steps involved in GMO/LMO detection (June 14, 2022).

INDIA

Cloning of "QTL-hotspot" for Drought Tolerance in Chickpea

Prof. Rajeev K. Varshney, Murdoch University

Chickpea (*Cicer arietinum* L.) is one of the most important legume crops cultivated on an area of ~14.84 million hectares with an annual production of ~15.08 million tonnes (FAOSTAT, 2020). Conventional breeding strategies have been successful over the past few decades in developing chickpea varieties that are more productive under the prevalent drought scenarios. However, these approaches alone are not enough to keep pace with future food demand. The realization of crop improvement can be substantially accelerated if assisted by innovation in genomics technologies, which have enabled rapid identification of genetic variation underlying crop performance and improved the efficiency of breeding.

"QTL-hotspot" for drought tolerance has been cloned, owing to the work of several collaborators from ICRISAT and other organizations around the world spanning almost 17 years.

It has been recently reported that the "QTL-hotspot" for drought tolerance has been cloned, owing to the work of several collaborators from ICRISAT and other organizations around the world spanning almost 17 years. Even before completion of cloning the "QTL-hotspot" region, it has been introgressed in several elite varieties of India, Ethiopia, and Kenya, in collaboration with the ICAR-Indian Agricultural Research Institute (IARI), ICAR- Indian Institute of Pulses Research (IIPR), Ethiopian Institute of Agricultural Research (EIAR), and Egerton University. As a result, after multi-location trials and required guidelines in the respective countries, several drought tolerant varieties have been released in India and Ethiopia in the last 3-4 years.

This list includes Pusa Chickpea 10216 (IARI), Pusa Chickpea 4005 (IARI), IPC L4-14 (IIPR), Pusa Chickpea Vijay (IARI), and Geletu (EIAR). Several other lines are in the varietal release pipeline in India, Ethiopia, Kenya, and Tanzania. Now, the cloning of the "QTL-hotspot" region has identified the *CaTIFY4b* gene responsible for enhancing the yield in chickpea under rainfed conditions. These results have been published recently in the *Plant Biotechnology Journal* (https://doi.org/10.1111/pbi.13840). This study offers new opportunities for gene editing in chickpea to delive drought tolerant and high-yielding chickpea varieties.

For more information, contact: Rajeev.Varshney@murdoch.edu.au

Researchers on the project.

BANGLADESH

Proceedings from the Webinar on Genome Editing in Agriculture: Status in Bangladesh and Way Forward

Kazi Toqi Yasir, South Asia Biosafety Program

Bangladesh Academy of Science (BAS), in collaboration with the South Asia Biosafety Program (SABP), Agriculture & Food Systems Institute (AFSI), and Biotech Consortium India Limited (BCIL) organized a webinar entitled "Genome Editing in Agriculture: Status in Bangladesh and Way Forward" on June 1, 2022. This webinar was the second in the "Genome Editing in Agriculture" series, with the first taking place on October 4, 2021. The second webinar illustrated research projects on improving plants at different institutions in Bangladesh. The webinar also provided participants with a platform to discuss how these improved plants can be made easily available to farmers, enabling them and consumers to put the benefits of genome-edited plants to use.

Dr. Vibha Ahuja, Chief General Manager, BCIL and Senior Advisor, SABP moderated the webinar, which included renowned scientists, researchers, faculty members, and students from multiple institutions.

Continued on page 9

Continued from page 8

A farmer displays his newly harvested tall purple eggplant © Jahangir Alam | Dreamstime.com

Prof. Dr. Haseena Khan, Secretary, BAS started the webinar with a welcome address. She pointed out that since Bangladesh is a low-lying country and vulnerable to monsoon flooding, making crops more resilient is of utmost urgency. She emphasized the need for easing the regulation of genome-edited plants so that the technology can be used to overcome disease infestations and adverse effects of climate change. Dr. Haseena Khan concluded with the suggestion that a well-defined regulatory system for genome-edited plants should be set up promptly.

Prof. Dr. Abul Kalam Azad Chowdhury, President, BAS observed that genome editing can play a revolutionary role in the agricultural sector in Bangladesh. He talked about how crops in Bangladesh are at risk from drought and salinity and pointed out the challenges with using traditional breeding techniques, which are time-consuming, difficult, and imprecise. Conversely, modern genome editing tools can bring desired changes precisely and easily. He ended his talk by expressing his appreciation for the collaboration of the organizing institutions in addressing the matter and wishing grand success to the event.

Since Bangladesh is a low-lying country and vulnerable to monsoon flooding, making crops more resilient is of utmost urgency.

Dr. Md. Shahjahan Kabir, Director General, Bangladesh Rice Research Institute (BRRI) was then invited to give his remarks. Among other things, he talked about the ongoing research at BRRI, including the development and release of several enriched rice varieties. He then spoke about his concern on the extensive use of chemical pesticides in Bangladesh. He acknowledged that genome editing can reduce this by helping in making plants pest resistant. In fact, scientists at BRRI, using genome editing tools, have been working to develop insect-resistant rice varieties. BRRI is also developing rice with improved aroma. Dr. Kabir concluded by highlighting the importance of timely regulatory support for such research.

Dr. Md. Salimullah, Director General, National Institute of Biotechnology (NIB) then shared his experiences on the topic and current activities at NIB. He highlighted two projects where CRISPR/Cas9 technology has been used for improving plants. The first is the development of abiotic stress tolerant eggplant, which was established in collaboration with ICGEB, India and the second is the development of diabetes-friendly high-amylose-containing rice. Regarding the CRISPR/Cas9 technology, Dr. Salimullah emphasized how it has been adopted globally and approved in many countries and that Bangladesh should also ease the regulations of genome-edited plants. He ended his remarks by thanking AFSI and SABP for their assistance in setting up a greenhouse at NIB and developing SOPs for field trials.

Dr. Md. Tofazzal Islam, Professor, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) and Fellow, BAS presented on gene editing in wheat. He started his presentation with a brief background on wheat blast disease and its impact on crop production. He discussed the challenges of detecting wheat blast and the role that CRISPR/Cas9 technology played in the detection of the disease, as well as in making wheat plants resistant to the disease. He ended with the suggestion of conducting training programs and expanding genome editing technology in molecular biology laboratories.

Mst. Muslima Khatun, Senior Scientific Officer, NIB then described the ongoing research on eggplant and rice at NIB. She also shared progress and priorities in the area of genome editing research. The research on eggplant included overexpression of mitochondria-targeted small heat shock proteins (sHSPs) to enhance its thermal tolerance. A similar experiment was carried out with rice, where the *SmsHSP24.1* gene from eggplant was used, and the rice showed a positive effect against heat and drought. In the case of diabetes-friendly rice, the CRISPR/Cas9 system was used to edit starch branching enzymes (SBE1 and SBE3), which increases the ratio of amylose to amylopectin, resulting in a lower sugar release rate in the blood. Ms. Khatun concluded by mentioning that NIB is constantly working to strengthen its capacity to contribute to the area of genome editing and biotechnological research and eventually, to the socio-economic development of the country.

Dr. Md. Panna Ali, Senior Scientific Officer, BRRI, gave his presentation subsequently. He further elaborated BRRI's genome-editing research on rice. Dr. Ali stated that about 108 varieties of rice are susceptible to stem borer and brown planthopper. It was discovered that plants whose serotonin biosynthesis is hampered tend to show insect resistance. This idea was used to knock out the serotonin-producing *CYP71A1* gene.

Continued on page 10

Continued from page 9

Similarly, modifying BADH2 enzymes can improve the aroma of rice, making it more market friendly. Dr. Ali then shared how the CRISPR/Cas9 system was used at BRRI to successfully develop insect-resistant and high-yielding aromatic advanced breeding lines.

Dr. Stuart Smyth, Associate Professor, University of Saskatchewan talked about how genome editing can contribute to the United Nations SDGs. He added that GM crops have increased yields at an average global rate of 22%, which is expected to grow. He discussed how GM crops can be modified to have increased yield, stress tolerance, and nutritional enhancements. GM crops can also increase the profits of farmers by producing higher yield. However, Dr. Smyth emphasised that gene editing can only contribute to SDGs if the technology is allowed to be commercialized with risk-appropriate regulation. He cited the example of Argentina, which does not regulate genome-edited plants if no foreign genes are introduced.

Dr. Ahuja then conveyed updates on genome editing regulations in India. As per the original regulatory framework, genome-edited plants were treated as GMOs. Giving a brief background of the biosafety regulatory framework of India, she noted amendments that can address new technologies requiring different treatments. She then shared the events that led to the exemption of SDN1 and SDN2 from the regulation and risk assessment under Rules, 1989. According to the new regulation, although genome-edited plants should still register with the institutional biosafety committee, the SDN1 and SDN2 plants would be treated as conventionally bred plants once the absence of any exogenous DNA is confirmed. Dr. Ahuja stressed that this decision will motivate scientists to carry out research on improving plants.

Dr. Karim suggested working closely with all stakeholders in this regard and [...] appealed for the preparation of a short policy document, which can be put forward by BAS for relevant government officials to pursue, regarding the regulatory approach for genome-edited plants.

A discussion session was then conducted on support required for taking forward the research to commercialization. Dr. Andrew F. Roberts, Chief Executive Officer, AFSI mentioned that consensus is moving towards a risk-proportionate approach to regulating genome-edited organisms. Discussions are happening in several countries around the world regarding exemptions of genome-edited plants from GMO regulations.

Dr. Aparna Islam, Professor, Brac University talked about how many signatories of the Cartagena Protocol on Biosafety (CPB), including Argentina, Chile, Brazil, Kenya, Nigeria, and India have decided to exempt SDN1 and SDN2 from biosafety regulations. She also mentioned that since the CPB is only applicable for organisms with novel combinations of genetic material, different countries may take decisions on genome-edited plants based on the extent of editing. She concluded by saying that being a signatory of CPB, Bangladesh should take into consideration the experience of other countries in formulating its approach to products of gene editing.

Dr. Rakha Hari Sarker, Country Coordinator, SABP and Professor, University of Dhaka emphasized that scientists in Bangladesh are actively working with innovative technologies like gene editing and some kind of mechanism should be present to make use of their research. He talked about how technologies like genome editing are essential to tackle issues related to climate change, nutrition, and food production. Dr. Sarker expressed his optimism, saying that if BAS takes initiative and if scientists and policy makers work together, then appropriate approaches to evaluate and commercialize genome-edited crops can be discussed and drafted.

Dr. Haseena Khan, during the discussion session, stressed how food security can become severe in Bangladesh due to the adverse effects of climate change. Genome editing can be utilized in this context as it is widely accessible and can accelerate the delivery of improved varieties to farmers. In her talk, Bangladesh was noted to be similar in the context of culture, flora, fauna, and climate to India, so easing of SDN1 and SDN2 systems in India could be used as a reference by Bangladesh.

The closing remarks were given by Dr. Zahurul Karim, Vice President, BAS. He appreciated the talks given by all the speakers and acknowledged the urgency of using genome editing in the agricultural sector. He pointed out that Bangladesh is not new in the field of GMO research and that the regulation of genome editing products should be discussed appropriately. Dr. Karim suggested working closely with all stakeholders in this regard and emphasized capacity building since few institutes are actually capable of carrying out advanced research. Furthermore, he appealed for the preparation of a short policy document, which can be put forward by BAS for relevant government officials to pursue, regarding the regulatory approach for genome-edited plants. Dr. Karim suggested the private sector also be brought into the discussion and proposed a national-level working group on the topic. He proceeded to thank everyone present and ended his talk hoping for a fruitful outcome.

Rice field in Bangladesh © Asif Himel | Dreamstime.com

Workshop on Safety Assessment of Foods Derived from Genetically Engineered Plants

Sium Ahmed, South Asia Biosafety Program

Guests and participants at the Workshop on Safety Assessment of Foods Derived from Genetically Engineered Plants (July 12, 2022).

In continuation of the initiative to increase the operational capacity to implement safety assessments for foods derived from Genetically Engineered (GE) plants in accordance with the guidelines, the South Asia Biosafety Program (SABP) and Bangladesh Food Safety Authority (BFSA) organized a technical training entitled "Workshop on Safety Assessment of Foods Derived from GE Plants." This workshop was intended for officers or committee members who will be responsible for technical reviews. The workshop was held on June 12, 2022 at the Training Room of BFSA, where 40 participants, including officials and scientists from BFSA, national research institutes, universities, government organizations, and representatives from private institutes were present. Mr. Md. Abdul Kayowm Sarker, Chairman, BFSA graced the workshop as the Chief Guest. Dr. Andrew Roberts, Chief Executive Officer, Agriculture & Food Systems Institute (AFSI) and Mr. Monzur Morshed Ahmed, Member (Public Health & Nutrition), BFSA were present in the webinar as the Special Guests.

Chief Guest, Mr. Md. Abdul Kayowm Sarker, focused on BFSA's current plans and future scenario [...]. He welcomed SABP to come forward with the capacity building initiatives so that BFSA officers can benefit from them.

The workshop began with the welcome address given by Prof. Dr. Rakha Hari Sarker, Country Coordinator, SABP, followed by a keynote address on "Introduction to the South Asia Biosafety Program and Biosafety Context in Bangladesh," given by Dr. Roberts. Dr. Aparna Islam, Professor, Brac University, discussed "Regulations for Products of Modern Biotechnology in Bangladesh." She elaborated on the country's situation with regard to agri-biotechnology research and development and biosafety regulatory processes. Another discussant, Dr. Emdadul Haque Chowdhury, Professor, Bangladesh Agricultural University (BAU) provided his thoughts regarding the biosafety regulatory regimes in Bangladesh. After this small discussion session, one of the Special Guests, Mr. Monzur Morshed Ahmed, provided his remarks. He emphasized the history of Bangladesh's journey towards the development of regulatory documents and constructing a path for compliance to the guidelines. In his remarks as Special Guest, Dr. Roberts mentioned that the documents are in place, and that regulators can move forward with terms of references for various committees and successfully perform their duties as per the guidelines. While addressing the audience as the Chief Guest, Mr. Md. Abdul Kayowm Sarker, focused on BFSA's current plans and future scenario, where they will be more equipped with manpower and skills to ensure safe food for all. He welcomed SABP to come forward with capacity building initiatives so that BFSA officers can benefit from them.

The first technical session was titled "Introduction to Concepts of Risk Assessment," where the first presentation was delivered by Dr. Stuart Smyth, Associate Professor, University of Saskatchewan. Dr. Smyth highlighted "Global Experience with GE Food and Feed," where he provided up-to-date information on the ongoing debates and global snapshots about GE crops and how these crops are contributing to the economic, social, nutritional, and environmental aspects. Following this, Dr. Roberts discussed the "Key Concepts in the Risk Assessment of GE Crops." He started with the history of GE foods and how they are made, then further elaborated on the safety assessment of foods derived from GE crops. This technical session ended with a clear and concise presentation on "Safety of Food Ingested rDNA and Novel Proteins," where Prof. Dr. Emdadul Haque Chowdhury described the concept of risk assessment and provided evidence, which confirmed that the recombinant DNA or proteins are digested after eating and have no effect on visceral organs.

In the second technical session, Dr. Bhavneet Bajaj, Manager–Scientific Programs, AFSI, provided insights on "International Guidance for Assessing Foods and Feeds Derived from GE Plants," where internationally accepted guidance like Codex Alimentarius Plant Guideline and OECD's resources were covered. Another talk on "Information Requirements per Bangladesh Guideline for Food Safety Assessment" was presented by Prof. Dr. Aparna Islam. She explained how foods derived from GE plants are assessed for safety using a step-by-step process as defined by the Codex Alimentarius.

The third technical session incorporated the "Development Process for GM Crops," where Dr. Bajaj explained the stepwise process in research and development, safety assessments, dossier preparation and submission, and how these numerous steps ensure that the final product is safe for use as food/feed and for use in the environment.

The technical sessions were very interactive, with participants eagerly asking questions and providing their thoughts and opinions, therefore making the workshop a very successful one. Participants stated that similar workshops will be beneficial for their future activities.

CALENDAR OF EVENTS

EVENT	ORGANIZED BY	DATE	WEBSITE
INDIA			
Training Program on Genetically Engineered (GE) Plants: Biosafety Considerations, Policies, Challenges and Detection Strategies	ICAR-National Bureau of Plant Genetic Resources	July 19-25, 2022 New Delhi	http://www.nbpgr.ernet.in/
Workshop on Feed Requirements for Livestock Sector: Opportunities and Challenges	Broiler Co-ordination Committee and BCIL	July 22, 2022 Coimbatore	https://forms.gle/UbHmMzjXhWJEZgzQ9
Workshop on Gene Editing for Crop Improvement: Opportunities and Enabling Policies	Department of Farmer Welfare and Agriculture Development, Madhya Pradesh; Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV), and Biotech Consortium India Limited (BCIL)	July 28, 2022 Bhopal	https://forms.gle/owPZ6ukdtKGV1TSGA
DBT-funded Training on Biosecurity and Biosafety: Policies, Diagnostics, Phytosanitary Treatments and Issues	ICAR-National Bureau of Plant Genetic Resources	August 2-11, 2022 Virtual	http://www.nbpgr.ernet.in/
11th National Seed Congress on Recent Advances in Research on Quality Seeds for Self Sufficiency in Oilseeds and Pulses	Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya	August 21-23, 2022 Gwalior	http://www.rvskvv.net/
International Conference on Advances in Agriculture and Food System Towards Sustainable Development Goals	All India Agricultural Students Association, Indian Council of Agricultural Research, and University of Agricultural Sciences, Bangalore	August 24-22, 2022 Bengaluru	https://aafs2022.org.in/
INTERNATIONAL			
Webinar Series for Popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries Towards Realizing its Potential - Webinar 3: Tree/ Woody Plants (Bamboo and Teak)	Asia-Pacific Association of Agricultural Research Institutions (APAARI)	July 29, 2022 Online	https://www.apaari.org/ https://zoom.us/webinar/register/WN_g5-HqPS-QSGm49HioepD6Q
Webinar Series for Popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries Towards Realizing its Potential - Webinar 4: Ornamental Plants	Asia-Pacific Association of Agricultural Research Institutions (APAARI)	August 26, 2022 Online	https://www.apaari.org/ https://zoom.us/webinar/register/WN_rL1D4CpFRU2nyOz4b3Uknw

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.

SOUTH ASIA BIOSAFETY PROGRAM

Agriculture & Food Systems Institute

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CONTACT SABP

BANGLADESH
Sium Ahmed
Biosafety Officer
South Asia Biosafety Program
c/o CIMMYT
House-10/B, Road-53, Gulshan-2
Dhaka-1212, Bangladesh
Email: sahmed@southasiabiosafety.org

UNITED STATES
Layla Tarar
Manager, Communications & Digital Learning
Agriculture & Food Systems Institute
1010 Vermont Avenue NW, Suite 202
Washington, DC, 20005, USA
Twitter: @AgFoodSystems
Email: ltarar@foodsystems.org

INDIA
Vibha Ahuja, Ph.D.
Chief General Manager
Biotech Consortium India Limited
Anuvrat Bhawan, 5th Floor
210, Deendayal Upadhyaya Marg
New Delhi 110 002, India
Email: vibhaahuja@biotech.co.in

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