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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.

THE NEED FOR TOXICITY ASSESSMENT IN THE FOOD SAFETY EVALUATION OF GENETICALLY MODIFIED CROPS/FOODS

Dr. B. Sesikeran, MD, Director, National Institute of Nutrition, ICMR, Tarnaka, Hyderabad - 500 007

Toxicity studies are essentially based on the model of predictability of the potential toxic effect of any particular substance. Since these are not possible to carry out on humans we evaluate through a process of pre-clinical safety testing. This would include a battery of testing using relevant predictive animal models and study protocols which are capable of providing us the answers for which these tests are being done. Every study protocol is designed taking into consideration the basic biology, metabolism and ultimate function etc.

In the specific case of genetically modified (GM) crops (for example Bt brinjal or maize, etc.), the issue of safety arises because the traditionally consumed food is now containing a new protein which may not have a history of being consumed by humans earlier. In acute toxicity study where multiple levels of exposure to the new protein i.e, 10 times, 100 times or even 1000 times higher than what is projected to be the maximum human intake, is administered to animals. We create an artificial situation, just to make sure whether at such extreme levels any kind of toxicity is likely to occur. Once this is addressed, the next phase in testing is primarily aimed at looking for any unintended effects which might arise out of any kind of nutritional imbalance or abnormal components entering into the food as an outcome of gene insertion. This study is usually preceded by comparison of all nutrients, non-nutrients, anti-nutrients and other known, signficant components of the non-GM counterpart with the GM variety. This is called as "Establishing Compositional/ Substantial Equivalence". This is the most reliable evidence of the safety of the GM crop, when both are similar in all respects and within the limits of natural variation. The next major issue is to reasonably establish that the new protein has no allergenic properties. This is done by a step wise testing process which includes looking for any sequence homology between the amino acid sequence of the new protein against a variety of allergenic proteins from a database, acid and/orpepsin stability testing and a thermal stability test. Most non-allergenic substances are unstable in gastric juice or when they are heated. If any of these are positive further tests like "ELISA" test with human serum from patients with known-history of allergy to the novel protein or its source could be done. Long-term chronic toxicity tests, which are typically performed for small molecules and non-protein substances, are not required here because proteins when taken orally get digested ultimately as amino acids. Therefore, they do not have identity once they are digested and therefore the question of orally ingested protein causing any chronic toxicity does not arise. Proteins can only act if they have appropriate receptor for binding in intestine which, in the case of the Cry proteins including Cry-1Ac, are only present in the intestinal tract of target insects. Cry proteins are also already in use and consumed by humans with no adverse effects. There is no scientific evidence of any protein causing a cancer or any reproductive abnormalities, again due to the simple reason that they do not enter a cell unless it is a receptor mediated mechanism. Cry-1Ac is also rapidly degraded (in 30 seconds) in the digestive juices. The Bt protein (cry proteins including Cry1Ac) are under GRAS category (Generally Regarded As Safe). No regulatory agency anywhere requires chronic toxicity to be done for this category of GMOs.

PLANT BIOTECHNOLOGICAL RESEARCH ACTIVITIES AND ACHIEVEMENTS AT BRAC

Dr. Md. Abdur Razzaque Shah, Tissue Culture Specialist, Plant Biotechnology Laboratory, BRAC, Joydebpur, Gazipur, Bangladesh

BRAC has become one of the largest non-governmental development organizations in the developing world and has placed a high priority on agricultural development because of its critical role in poverty alleviation and its potential for generating employment and income for poor and marginal farmers. Through this focus, BRAC has made significant contributions to agricultural production and has also had an impact in improving the nutritional status of the population of Bangladesh. BRAC believes that the goal of increased food production can be achieved through improvement of presently available technologies and intensification of crop production in marginal lands. In particular, BRAC recognizes that there is an unmet demand for high quality seed produc-

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CALENDAR OF EVENTS			
Event	Organized by	Date and Venue	Website
INDIA			
National Seminar on Current Concepts in Biotechnology	Department of Botany, University College	March 24, 2010 Thiruvananthapuram	http://www.universitycollege.co.in/
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
ABIC 2010: Bridging Biology and Business	Agricultural Biotechnology International Conference	September 12 - 15, 2010 Saskatoon, Canada	http://www.abic.ca/abic2010/
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.webnode.com/
An Introduction to the Risk Analysis of Current Genetically Modified Organisms (GMOs) and their Products, and to Possible Issues Raised by Novel GMOs in the Future	Biosafety Unit, International Centre for Genetic Engineering and Biotechnology (ICGEB)	September 27 – October 1, 2010 Trieste, Italy	http://www.icgeb.org/meetings-and-courses.html

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tion and is addressing this working on both production and distribution systems.

With this objective in mind BRAC has been integrating some applications of agricultural biotechnology that have the potential to provide new solutions. As an example, the shortage of high quality seed tubers is one of the major constraints in increasing the productivity of potato in Bangladesh. Only eight to ten per cent of the planting material available to the farmers is produced under controlled conditions to ensure high quality. The majority of seed tubers are retained from production fields with no efforts made to ensure disease-free material and a market exists for cheap, high quality, locally produced seed tubers. BRAC's objective is to claim a substantial portion of this market as well as helping farmers to increase their productivity and income.

In view of the need to provide stocks of disease-free planting materials for the farmers, plant propagators and seed producers of Bangladesh, BRAC set up of a small scale tissue culture laboratory in June 1997 to undertake the micro-propagation of banana, potato plantlets/micro tubers and ornamental plants. Two years of experimentation and observation showed promising results with potato, ornamental plants and banana tissue culture. Based on the success of the initial work, and the continued demand for high quality disease-free tubers and plantlets, BRAC set up a new biotechnology laboratory at Gazipur, 35 kilometers from Dhaka, close to government agricultural research institutes.

BRAC Tissue Culture Laboratory

BRAC's biotechnology laboratory is well equipped with modern tissue culture facilities and equipment for meristem culture and micro-propagation. The tissue culture production facilities comprise three growth rooms each with a capacity for accommodating 25,000 culture bottles at a time. There are ten laminar air flow cabinets for sterile work and ancillary rooms, such as a media preparation facility with a capacity for preparing 4,000 bottles (60-70 liters) of medium/day. In addition four greenhouses each with an area 3,000 sq. ft have been constructed, complete with movable benches, an automatic shade system, fogging, blackout and irrigation systems. A further 12,000 sq. ft. of 50 and 75 per cent shade net houses for hardening of tissue culture raised plantlets is available.

The laboratory is run by highly qualified and experienced staff including one PhD and four with Masters degrees. There are 30 laboratory assistants working in the facility and 25 agriculture graduates to maintain the field facilities. BRAC biotechnology is the largest unit in Bangladesh and has successfully adapted tissue culture techniques for mass multiplication of a wide range of plant species such as potato, banana, starfruit, jackfruit, olive, sweet karamcha, wood apple, lemon, strawberry, papaya, orchids, carnation, gerbera, anthurium, agave, ornamental taro, neem, and stevia selected according to the priority crops in the country.

Production of high quality seed potatoes for growers was one of the first projects undertaken at the BRAC biotechnology facility. The tissue culture laboratory produces plantlets which are grown for two seasons in the shade net houses for mini tuber and pre-foundation seed production. Pre-foundation seeds are multiplied for another two seasons in the open field as foundation and then certified seed. Certified seed tubers are distributed to the growers for table potato production. From 10-12,000 plantlets 4-450 MT of certified seed tubers

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The Reading List

. . . new and notable articles

PLANT BIOTECHNOLOGY PATENTS: APPLICATIONS IN AGRICULTURE AND MEDICINE

K. Hefferon

Recent advances in agricultural biotechnology have enabled the field of plant biology to move forward in great leaps and bounds. In particular, recent breakthroughs in molecular biology, plant genomics and crop science have brought about a paradigm shift of thought regarding the manner by which plants can be utilized both in agriculture and in medicine. Besides the more well known improvements in agronomic traits of crops such as disease resistance and drought tolerance, plants can now be associated with topics as diverse as biofuel production, phytoremediation, the improvement of nutritional qualities in edible plants, the identification of compounds for medicinal purposes in plants and the use of plants as therapeutic protein production platforms. This diversification of plant science has been accompanied by the great abundance of new patents issued in these fields and, as many of these inventions approach commercial realization, the subsequent increase in agriculturally-based industries. While this review chapter is written primarily for plant scientists who have great interest in the new directions being taken with respect to applications in agricultural biotechnology, those in other disciplines, such as medical researchers, environmental scientists and engineers, may find significant value in reading this article as well. The review attempts to provide an overview of the most recent patents issued for plant biotechnology with respect to both agriculture and medicine. The chapter concludes with the proposal that the combined driving forces of climate change, as well as the ever increasing needs for clean energy and food security will play a pivotal role in leading the direction for applied plant biotechnology research in the future.

Recent Patents on Biotechnology 2010 Feb 25. [Epub ahead of print]

IDENTIFICATION OF A RICE STRIPE NECROSIS VIRUS RESISTANCE LOCUS AND YIELD COMPONENT QLTS USING *ORYZA SATIVA* X *O. GLABERRIMA* INTROGRESSION LINES

A.G. Gutiérrez, S.J. Carabalí, O.X. Giraldo, C.P. Martínez, F. Correa, G. Prado, J. Tohme and M. Lorieux

Developing new population types based on interspecific introgressions has been suggested by several authors to facilitate the discovery of novel allelic sources for traits of agronomic importance. Chromosome segment substitution lines from interspecific crosses represent a powerful and useful genetic resource for QTL detection and breeding programs. RESULTS: We built a set of 64 chromosome segment substitution lines carrying contiguous chromosomal segments of African rice *Oryza glaberrima* MG12 (acc. IRGC103544) in the genetic background of *Oryza sativa* ssp. tropical japonica (cv. Caiapó). Well-distributed simple-sequence repeats markers were used to characterize the introgression events. Average size of the substituted chromosomal segments in the substitution lines was about 10 cM and covered the whole donor genome, except for small regions on chromosome 2 and 4. Proportions of recurrent and donor genome in the substitution lines were 87.59% and 7.64%, respectively. The remaining 4.78% corresponded to heterozygotes and missing data. Strong segregation distortion was found on chromosomes 3 and 6, indicating the presence of interspecific sterility genes. To illustrate the advantages and the power of quantitative trait loci (QTL) detection using substitution lines, a QTL detection was performed for scored traits. Transgressive segregation was observed for several traits measured in the population. Fourteen QTLs for plant height, tiller number per plant, panicle length, sterility percentage, 1000-grain weight and grain yield were located on chromosomes 1, 3, 4, 6 and 9. Furthermore, a highly significant QTL controlling resistance to the Rice stripe necrosis virus was located between SSR markers RM202-RM26406 (44.5-44.8 cM) on chromosome 11. CONCLUSIONS: Development and phenotyping of CSSL libraries with entire genome coverage represents a useful strategy for QTL discovery. Mapping of the RSNV locus represents the first identification of a genetic factor underlying resistance to this virus. This population is a powerful breeding tool. It also helps in overcoming hybrid sterility barriers between species of rice.

BMC Plant Biology (2010): 10:6

TOMATO PLANTS TRANSFORMED WITH THE INHIBITOR-OF-VIRUS-REPLICATION GENE ARE PARTIALLY RESISTANT TO *BOTRYTIS CINEREA*

G. Loebenstein, D.R. David, D. Leibman, A. Gal-On, R. Vunsh, H. Czosnek, Y. Elad

Tomato plants transformed with a cDNA clone encoding the inhibitor-of-virus-replication (IVR) gene were partially resistant to *Botrytis cinerea*. This resistance was observed as a significant reduction in the size of lesions induced by the fungus in transgenic plants compared with the lesions on the nontransgenic control plants. This resistance was weakened when plants were kept at an elevated temperature, 32 degrees C, before inoculation with *B. cinerea* compared with plants kept at 17 to 22 degrees C prior to inoculation. Resistance correlated with the presence of IVR transcripts, as detected by reverse transcription-polymerase chain reaction. This is one of the few cases in which a gene associated with resistance to a virus also seems to be involved in resistance to a fungal disease.

Phytopathology (2010) 100(3):225-9

We welcome reader comments or suggestions.
E-mail your letters to: nringma@agbios.com

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are produced after four generations. It was reported that average potato yield from this certified seed is 35 to 45 MT/ha whereas the yield is only 11 to 12 MT/ha using seed from local sources. The BRAC biotechnology facility currently performs seed production of five varieties: Diamant, Asterix, Cardinal, Felsina and Granola. Seed potato multiplication in the field is monitored regularly by internal and external experts to maintain the seed quality.

Superior varieties of different fruit plants are also being multiplied through tissue culture. In recent years the BRAC biotechnology facility planned to produce 30,000 fruit plantlets, including banana, jackfruit, strawberry, sweet karamcha, and lemon. Recently, the BRAC tissue culture laboratory developed a protocol for large scale propagation of a medicinal plant called Stevia. Stevia contains compounds called steviosides that are 250-300 times sweeter than common sugar with no calorific value. Stevia has recently been approved in the United States as a sweetening agent and is also thought to have hypertensive, hypoglycemic and bactericidal properties. Production of Stevia plants is a notable success of the BRAC tissue culture lab and represents a new opportunity for farmers. By cultivating Stevia farmers may easily earn Taka 30-40,000/acre as net profit per year.

BRAC has recognized the potential of using modern biotechnological methods for the development of stress tolerant crop varieties. At the biotechnology facility, BRAC has all modern facilities for conducting basic tissue culture and may initiate plant genetic engineering research work in the near future to develop disease and pest resistant varieties of potato, chickpea, papaya, egg plant, rice and maize, etc. This is in keeping with the national priorities of Bangladesh to continue to improve agricultural productivity.

BANGLADESH NATIONAL INSTITUTE OF BIOTECHNOLOGY BILL-2010

National Institute of Biotechnology Bill, 2010 was passed by the National Parliament of Bangladesh on March 2, 2010. The State Minister for Science and Information & Communication Technology, Architect Yeafesh Osman, proposed the passage of the bill in the parliament. The bill includes the provisions for authorizing National Institute of Biotechnology (NIB) as an autonomous body. The institute will carry out eco-friendly genetic engineering and biotechnological research in the field of agriculture, environment, health care and industrial sectors that will ultimately link up with the socio-economic development of the country. NIB will be built up as a centre of excellence in biotechnology research and technology transfer of the country.

GLOBAL STATUS OF GM CROPS 2009 AND ITS CONTRIBUTION TO FOOD SECURITY IN BANGLADESH

On March 11, 2010, a seminar on the global status of GM crops was dedicated to the Nobel Laureate Norman E. Borlaug was held in the BARC Auditorium in Dhaka. Dr. Borlaug was the first Founding Patron of ISAAA, the International Service for the Acquisition of Agri-Biotech Applications and the seminar was organized by the Bangladesh Biotechnology Information Centre (BdBIC) of ISAAA in collaboration with Bangladesh Agricultural Research Council (BARC) and the Bangladesh Association for Biotechnology & Genetic Engineering (BABGE). The seminar was held at the Auditorium of BARC and included the launch of the "Global Status of Biotech Crops" published by ISAAA by the Executive Chairman, BARC and Dr. Randy Hautea, Global Coordinator, ISAAA.

Dr. Wais Kabir, Executive Chairman, BARC was the Chair of the seminar that included guests and participants from various NARS institutes, universities as well as from different donor agencies. Distinguished guests present during the seminar were Prof. Dr. Sharif Enamul Kabir, Vice Chancellor, Jahangirnagar University; Dr. Md. Abdur Razzaque, Former Executive Chairman, BARC & Project Director, NAT; and Directors General of BRRI and Bangladesh Sugarcane Research Institute (BSRI).

In presenting the ISAAA 2009 report on the global status of GM crops, Dr. Hautea described the production of biotech crops in different developed and developing countries. He highlighted the advantages of biotech crops as well as the benefits being enjoyed by the biotech crop growers. Dr. Hautea also explained that there are still some debates on the biotech crops that need to be resolved and requested the concerned government authorities take a strong stand in favour of biotech crops.

Dr. Md. Abdur Razzaque in his speech mentioned that agricultural biotechnology is not a solution in itself, but a potential tool to increase the productivity of different economic crops. He urged those in attendance to look for ways for the technology to be used to help poor farmers and emphasized that crops that can be grown with reduced inputs would be of great benefit as well as abiotic and biotic stress tolerant crop varieties. Dr. Razzaque also suggested that attendees identify the people who fabricate the news on the newly emerging scientific development and urged scientists to develop easily understandable science communication systems.

Dr. Wais Kabir in his concluding remarks noted that Bangladesh dreams to be a prosperous country, but 40 per cent of the population are living below poverty levels and child mortality is still very high. He suggested the utilization of agricultural biotechnology could increase the productivity of the major crops of Bangladesh to feed the increasing population of the country. Dr. Kabir mentioned that although there are proven benefits of biotech products there is also lot of opposition to adopting biotech products. He suggested the accommodation of these criticisms and that decisions be made on the basis of scientific principles and not on emotions. He also stressed that to achieve the full benefit of biotech crops the strengthening of the Biosafety Regulatory systems in Bangladesh.

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