**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.

**TRANSGENIC IMPROVEMENT OF PIGEONPEA AND CHICKPEA AT ICRISAT**

Kiran K. Sharma and Pooja Bhatnagar-Mathur, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, Andhra Pradesh, Email: k.sharma@cgiar.org

Pulses such as chickpea and pigeonpea form an important part of the diets of people in arid regions of the world, particularly the Indian subcontinent, and are an important source of vitamins, minerals and essential amino acids. However, these crops suffer heavy losses due to susceptibility to insect pests like pod borer, other diseases such as fungal pathogens, as well as a low tolerance to drought and low temperatures. Since there is little variability in the available germplasm for many of these constraints, the use of modern biotechnological approaches such as transgenic technology provides an attractive alternative for the development of enhanced germplasm in these crops.

Transgenic technology relies on the technical approaches of plant tissue culture and molecular biology for both research and to develop commercial products. ICRISAT has recognized the importance of the application of the genetic engineering technologies for the genetic enhancement of these important pulses and extensive efforts have been made over the past decade to develop in vitro tissue culture and Agrobacterium-mediated transformation systems for both pigeonpea and chickpea. Procedures that are efficient and reproducible are now available in both of these crops for routine applications. In addition, progress has been made in introducing specific traits into both pigeonpea and chickpea as detailed below.

The legume pod borer, (*Helicoverpa armigera*) is the major pest in these pulse crops, causing almost 50 per cent of the annual losses. Transgenic chickpeas and pigeonpeas expressing *cry1Ab, cry1Ac* and *cry2Aa* genes from *Bacillus thuringiensis* (Bt) have already been developed at ICRISAT and are being subjected to insect bioassays to identify events showing high Bt expression. ICRISAT conducted the world’s first confined field trials on chickpeas with some of these selected transgenic events during 2003-2005 and events that showed promise in these trials have been advanced to further generations.

Projects are also underway to address nutritional aspects such as enhanced β-carotene (provitamin A) production and seed-specific expression of sulfur-rich amino acids like methionine in pigeonpea. Preliminary studies showed a 2-6 fold increase in the total carotenoids and a 2-4 fold increase in the β-carotene levels in some of the selected pigeonpea events. Biofortified pigeonpea has the potential to positively impact the health and nutrition of resource-poor people in the semi-arid tropics.

Since these pulse crops are grown in the rain-fed regions and are therefore exposed to severe climates in semi-arid regions, at ICRISAT complex abiotic constraints like drought are also being addressed using transgenic approaches.

The P5CSF129A gene encoding Δ1- pyrroline-5-carboxylate synthetase has been over-expressed in chickpea, under the control of the CaMV 35S promoter, for overproduction of proline. Proline acts as osmolyte and is known to have a role in osmotic adjustment and cell protection under water deficits. In another project, the *DREB1A* from *Arabidopsis thaliana* was introduced into a popular chickpea cultivar in order to improve both drought and salinity tolerance. The *DREB* gene is a transcription factor capable of transactivating DRE-dependant transcription in plant cells under the control of stress inducible rd29 promoter. Several events over-expressing *DREB1A* showed superior water use efficiency when compared to their wild type counterparts. These transgenics are currently being evaluated under greenhouse conditions (continued on page 2 - see Pigeonpea)
programme will facilitate collaborative efforts and provide a Platform for Translational Research on Transgenic Crops (PTTC), a collaborative effort between DBT and ICRISAT. This Platform for Translational Research on Transgenic Crops is improving the value of the harvested pulses. 

Coping with productivity constraints in these crops as well as advances will immensely benefit resource poor farmers in future breeding programs or in combination with other technologies into crop varieties that will be taken through the gates of interest. These are examples of how transgenic technology could be used in chickpea and pigeonpea for the introduction of pest resistance, abiotic stress tolerance as well as value-added traits such as improved nutritional content. The transgenic plants referred to above are in different stages of development and are being studied further for their stability and efficacy. If successful, these events may be directly used in future breeding programs or in combination with other genes of interest. 

Selected events will be further developed through the Platform for Translational Research on Transgenic Crops (PTTC), a collaborative effort between DBT and ICRISAT. This programme will facilitate collaborative efforts and provide a coordinated approach for translating these transgenic technologies into crop varieties that will be taken through the required food, feed and environmental safety studies prior to commercialization. Products developed through these advances will immensely benefit resource poor farmers in coping with productivity constraints in these crops as well as improving the value of the harvested pulses.

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

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How biotechnology can help boost farm yields and improve diets in poor, developing parts of the world.

How biotechnology is helping to improve the environment by reducing plowing and the need for spraying, thus curbing erosion, conserving fuel and preserving wildlife habitats.

How biotechnology can help farmers better manage water resources, particularly in the face of drought or water shortages.

How biotechnology is helping to grow increased yields of crops used for both food and production of biofuels.

How biotechnology has become one of the most rapidly adopted technologies in the history of agriculture.

How biotechnology is improving farmers’ bottom lines, whether it’s a soybean farmer in Iowa, a cotton farmer in South Africa or a papaya farmer in Hawaii.

How respected organizations from around the world have declared that foods developed with biotechnology are safe and hold great promise for improving diets and health.

The Council for Biotechnology Information (CBI) is a US-based non-profit organization that communicates science-based information about the benefits and safety of agricultural biotechnology and its contributions to sustainable development. The site is divided into three sections. It also has a link to its YouTube channel.

Sections include:

**Resources & Information:** Contains areas with fact sheets, issue briefs, myths & facts, an activity book for children, third party studies, an experts list, which features information on the research of leading experts in the field, and an agricultural biotechnology timeline.

**News & Events:** This area includes sections for biotechnology stories from the news, a Reporter’s Notebook and a press kit.

**Links:** Categorized by both geography and topic. Categories include:
- Africa
- Agriculture
- Australia and New Zealand
- Biofuels
- Environment
- Europe
- India
- International Organizations
- Member Companies
- Nutrition and Health
- Related Organizations
- Research Institutions
- Safety and Regulations

Using print, videos and podcasts the CBI website has stories about:

- How biotechnology could one day help people lead healthier lives through the development of new products such as cancer-fighting tomatoes and oils with reduced levels of saturated fats.

An example of a CBI Fact Sheet

**PRODUCING MORE CROP PER DROP**

Nearly every year, some parts of the United States and other parts of the world suffer from drought, which can hamper the growth of crops and significantly reduce harvests. It is estimated that in any given year, one-third of all U.S. corn acres experience some level of yield-reducing drought stress. Climatologists believe that our changing global climate might produce even more severe and widespread dry conditions in the future, with potentially serious consequences for the U.S. food supply and food security community (Wenzel, 2008).

Did You Know?
- Drought affects large parts of the United States every year and has been a persistent problem for generations. Some researchers predict that as demand for food in the United States could lead to severe food shortages and increasing food prices, creating a serious problem. For this reason, the United States is considered a leading producer of food in the world.
- Adequate water is the most pressing challenge for the nation’s farmers who provide us with essential crops and grains used for food, fiber, and industrial products. It is predicted that 2 out of 3 people will live in drought or water-stressed conditions by the year 2025. U.S. food production is crucial to meeting our food needs, and it is estimated that the production of major crops in the United States is currently estimated to be 60% of the world’s food production.
- For over 12 years, farmers have been using plants engineered through biotechnology to combat environmental stresses such as insects and weeds, resulting in reduced chemical use and an increase in crop yields.

CBI YOUTUBE CHANNEL: WWW.YOUTUBE.COM/USER/CBIWASHINGTONDC
CBI AGBIOTECH BLOG: HTTP://AGBIOTECHBLOG.COM
www.whybiotech.com
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RECENT USDA FUNDED PROJECTS ON BIOTECHNOLOGY

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<td>Multiplication and Conservation of Endangered Tree Species (Xylocarpus granatum) of Sundarbans Mangrove Forest Through Micropropagation Technique and Their Prospect in Restoration Programme in the Coastal Zone of Bangladesh</td>
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<td>Detection of Entervirulent Escherichia coli strains by a Sensitive and Versatile Multiplex Polymerase Chain Reaction (PCR) System in Shrimp Farms</td>
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<td>Dr. Md. Mahbubur Rahman</td>
<td>Department of Biotechnology, Shahjalal Science and Technology University</td>
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Contact colleagues in the United States to arrange exchange visits, which has the double benefit of ensuring exposure of Bangladeshi scientists to sophisticated research and the sensitization of United States-based scientists to the problems of Bangladesh.

Funds for research at public universities are limited in Bangladesh where most available resources are spent for undergraduate practical laboratories. USDA research funds have been instrumental in setting up laboratories where graduate researchers have been able to work on up-to-date technologies. These funds have supported the Ph.D. work of more than a dozen students. Academic staff at the targeted public universities have been able to work on important and sophisticated research ideas relevant to Bangladesh’s problems. Their findings have been published in international journals and many graduate students have been able to train in modern research methodologies.

Dr. Stevenson set up an innovative way of using the interest of the USDA grant money. The ‘Young Women Scientists Award’ at Dhaka University and ‘Young Scientists Award’ at BAU encouraged student researchers to attend conferences to present their works. Small grants were provided to the students for travel and accommodation costs at the conferences. More than a dozen post-graduate students have used these grants to attend international conferences and workshops.

The USDA-Bangladesh program not only resulted in the publication of important discoveries, it boosted the morale of scientists and resulted in tangible products for Bangladesh. Currently the USDA funds are being sourced to the Bangladesh Academy of Sciences and further scientific research will be managed by the Academy.

SABP CONTACTS

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

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

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