



A weekly summary of world developments in agri-biotech for developing countries, produced by the Global Knowledge Center on Crop Biotechnology, International Service for the Acquisition of Agri-biotech Applications SEAsiaCenter (ISAAA).

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News

GLOBAL

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UTILITY OF DNA BANKS IN BIODIVERSITY STUDIES

Analyzing DNA sequence is the best way to determine diversity, and the technique has helped many taxonomic studies. The manipulation of DNA also has made a huge impact on plant breeding and biotechnology. Realizing that DNA is an important resource, DNA banks that conserve collections from various plant species have been established worldwide.

DNA banks have been around since the 1980s. However, they mostly operate independently of each other and formal collaboration among them is still not well established. To maximize their utility, Thomas Hodkinson in the University of Dublin, Ireland and his colleagues have presented their view that integrating such facilities with herbaria, botanic gardens, genebanks, seed banks and bioinformatic resources should be practiced.

Hodkinson's group encourages the establishment of more DNA banks. The researchers reviewed in their paper the basic operations in a DNA bank including protocols for DNA collection, preservation, isolation, storage, database management and exchange procedures. The information may be useful to researchers who wish to set up or those already managing a DNA bank facility.

Subscribers to the Journal of Plant Research can access the complete paper at <http://dx.doi.org/10.1007/s10265-006-0059-7>.

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PUBLIC SECTOR CRITICAL IN DELIVERING BENEFITS OF PRO-POOR AGRI-BIOTECH APPLICATIONS

There is a growing gap between private and public investments in agricultural research. As the global investment trend by the private sector is increasing, those from the public sector have remain unchanged or has decreased, says David Spielman of the International Food Policy Research Institute in his review paper published by the Food Policy journal.

Agricultural biotechnology offers more possibilities in increasing food and feed production than the Green Revolution. However, Spielman believes that for ag-biotech to help alleviate poverty, the leadership role of the public sector should be strengthened, along with increasing partnerships, and new policy and organizational mechanisms for delivering products of the technology.

Other aspects where the current ag-biotech institutional design can improve include knowledge exchange, tackling market constraints, and addressing shortages of funding and capacity in national research systems. The improvements in the institutions that govern the research activities of public organizations is just one way of helping remove impediments to pro-poor technological change in agriculture. The private sector should also be encouraged to be involved in more pro-poor research, Spielman concluded.

The review paper can be accessed by journal subscribers at <http://dx.doi.org/10.1016/j.foodpol.2006.05.002>.

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FAO SUPPORTS URBAN AGRICULTURE

The United Nations Food and Agriculture Organization (FAO) has adopted a new tactic to curb hunger and malnutrition, and it is set in the world's cities where most of the global population growth is expected. FAO is advocating "urban agriculture" as one element in urban food supply systems, in response to the surging size of the cities of the developing world. Under its ongoing "Food for the Cities" program, an interdisciplinary initiative, FAO is helping a number of cities to support urban and peri-urban agriculture so that they can increasingly contribute to the job of feeding themselves.

In the Democratic Republic of Congo, FAO is working alongside city authorities to help develop 800 hectares of urban land in several cities into allotment gardens, while in the Colombian cities of Bogota and Medellin, a novel approach is being experimented by FAO to address the issue of slums. "This project is giving a whole new dimension to the concept of 'home-grown'," says Juan Izquierdo, FAO's Plant Production and Protection Officer in Latin America.

To read more: <http://www.fao.org/newsroom/en/news/2007/1000484/index.html>.

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BIOSAFETY IN A BOUNDLESS WORLD

Biosafety is defined as the prevention of large-scale loss of biological diversity and integrity due to human activities. It has been often reduced to potential risks due to genetically modified (GM) plants. Important concerns regarding GM plants, however, are not exclusive problem of these plants. Non-native plants and pathogens also have dramatic ecological impact on some plant species, but only a small number of plants introduced into a new environment become invasive. Natural and induced mutations in traditional plant breeding, however, can catalyze the evolution of invasiveness. Concerns regarding uncontrolled gene flow between organisms that are sexually compatible have prompted the development of genetic conservation programs in many countries.

Novel risks introduced by new technologies are presumed greater than established ones, even if the latter are less well characterized. Perhaps the most difficult hurdle facing the advance of genetic modification is not a technical but a psychological one; hence, there is a need for an independent and objective biosafety research devoid of restrictions from the government.

Readers can access the complete news article at <http://www.isb.vt.edu/news/2007/news07.feb.htm#feb0702>.

AFRICA

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UNIDO DG ROUTES FOR BIOTECH, BIOFUELS IN AFRICA

The Director General of the United Nations Industrial Development Organization (UNIDO), Dr Kandeh Yumkellah, has called on African scientists and leaders to make Africa a world leader in biofuels production.

Speaking in Nairobi Monday, February 5 during the monthly Open Forum for Agricultural Biotechnology (OFAB 4) initiated by the African Agricultural Technology Foundation (AATF), Dr Yumkellah, said Africa had the greatest potential to supply the world with biofuels but that it would only be able to do so if right policies are put in place and scientists given adequate support to conduct research.

He said it would be sad for scientists in Africa, including those serving under the CGIAR on the continent, just to sit back only for them to come back 15 years later to conduct retrogressive research on how and why Africa lost again in the on-going agricultural biotechnology and biofuels revolutions.

The DG said Africa could produce enough cassava, palm oil, sugar cane, maize, among other crops and trees to produce biofuels for the continent and for export. However, he said that for an agricultural revolution there would have to be formed strong public and private partnerships to marshal new technologies and investments. He promised UNIDO support and asked AATF through its Executive Director, Dr Mpoko Bokanga, to help rally African farmers, scientists and leaders for a sustainable agricultural revolution so that the continent can be food secure and also produce surplus for biofuels' generation.

For more information contact the African Agricultural Technology Foundation ate-mail: aatf@aatf-africa.org

AMERICAS

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ECONOMIC AND ENVIRONMENTAL BENEFITS OF BIOTECH IN BRAZIL

A survey by Consultoria Céleres that examined the socio-economic benefits of biotech soybeans, corn, and cotton in

Brazil indicated possible significant profits for farmers. The survey requested by Brazil's Council for Biotechnology Information (CIB), indicated that a total of about \$4.6 billion could already have been gained by soybean farmers if they have not delayed the adoption of biotech soybeans.

For biotech corn and cotton, it is projected that the benefits for Brazilian farmers would total to \$6.9 billion and \$2.1 billion, respectively, in the next ten years. The benefits were attributed to increase in crop exports and reduction in pesticide use. The survey recommends that for farmers to reap these benefits there should be urgent changes in the country's regulatory system to maximize the technology's potential.

The complete press release (in Portuguese) is at http://www.cib.org.br/em_dia.php?id=822.

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UNITED STATES, BRAZIL COLLABORATE ON GENETIC RESOURCES PRESERVATION

The preservation of genetic diversity and genetic resources is vital to agriculture, and the importance of proper maintenance of genebanks cannot be underestimated. Using the genetic material of maize, scientists at the Agricultural Research Service National Center for Genetic Resources Preservation (NCGRP) and its Brazilian counterpart Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA) are off to find out how maize grains respond to both extremely cold cryogenic storage and conventional storage over time. The results of the study on maize may also extend to other crops. This will aid both countries in evaluating the cost efficiency of their respective genebanking systems and could guide future investment decisions.

Read the full article at <http://www.ars.usda.gov/is/AR/archive/feb07/seeds0207.htm>.

LETTUCE FIGHTS BACK ARCH ENEMIES [Top]

Iceberg lettuce is the unfortunate target of barrage of an impressive array of microbes. Some of these microbes are transmitted to lettuce fields by piercing and sucking insects such as aphids and whiteflies, while others team up microbes in invading susceptible lettuces. To help iceberg lettuce and its relatives counter the attacks of stealthy microbes, scientists at the United States Department of Agriculture Agricultural Research Service (ARS) have developed parent lettuces with resistance to two major diseases – lettuce mosaic and big vein.

Lettuce big vein gets its name from the unhealthy, enlarged appearance of veins in infected lettuce leaves. It is caused by the Mirafiori lettuce big vein virus, which makes its way to lettuce roots via a soil-dwelling, fungus-like microbe. Lettuce mosaic, on the other hand, is caused by a virus of the same name. Green peach aphids can spread the virus from an infected plant to an uninfected one as they move about a lettuce field. The scientists are expanding on this work by pursuing other genes that would provide superior resistance to these diseases or to any of about a half-dozen other microbes that the researchers are scrutinizing.

The complete article can be accessed at <http://www.ars.usda.gov/is/AR/archive/feb07/lettuce0207.htm>.

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AEROPONICS: GROWING POTATOES IN MID-AIR

The International Potato Center (CIP) has been using a new technique called aeroponics in growing seed potatoes. Aeroponics consists of cultivating potato seedlings on specially adapted frames so that the roots, and the tubers,

grow suspended in the air, without touching the soil. Through this technique, a higher yield of seed tubers per plant of native potato varieties were obtained compared with those harvested using conventional techniques.

Read the full article at http://www.cipotato.org/pressroom/press_releases_detail.asp?cod=32.

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LIVE-CELL IMAGING OF GREEN FLUORESCENT PROTEIN IN PLANTS

The green fluorescent protein from jellyfish *Aequorea victoria* is a very stable and relatively small protein that serves as a molecular marker. It can be imaged dynamically in living cells, both in its native form and as a fusion to other proteins. The Cold Spring Harbor Laboratory recently published a protocol on live-cell imaging of GFP in plants.

Successful imaging of GFP fusions depends on adequate expression levels relative to background autofluorescence from chlorophyll, lignified cell walls, vacuolar contents, and other cell materials, which can obscure the GFP signal. Consequently, root tips of *Arabidopsis* are among the best tissues for live-cell imaging. These tissues lack chlorophyll, are transparent, and can be grown on a microscope stage.

The full article can be read at <http://www.cshprotocols.org/cgi/content/full/2007/3/pdb.ip31>.

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PROCEEDINGS ON GM FOOD AND FEEDS, IMPLICATIONS FOR US DOMESTIC POLICIES

The Pew Initiative on Food and Agriculture held a workshop "Commercial, Safety, and Trade Implications Raised by Importation of Genetically Engineered Ingredients, Grain or Whole Foods for Food, Feed, or Processing" last year to examine issues related to the potential importation into the U.S. of new varieties of genetically engineered (GE) crops and the various implications this could have on the U.S. regulatory system and food industry. Some of the key issues discussed include:

- The difficulties that would be faced by U.S. government agencies and the U.S. food chain in attempting to identify potential GE imports;
- A possible increase in the accidental mixing of GE with non-GE products as more countries begin cultivating transgenic food crops;
- The risks posed by GE imports may be more serious for business interests than consumer health; and
- The need for international discussion aimed at developing a rational system for monitoring and enabling trade in genetically engineered organisms (GEOs) that can ultimately benefit producers of GE products worldwide and those in the food industry.

The conference proceedings are now available online at <http://pewagbiotech.org/events/0907>. For more information contact Kara Flynn: kflynn@pewagbiotech.org.

ASIA AND THE PACIFIC

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CHINESE FARMERS ADOPT ICRI SAT PIGEON PEA

Pigeon pea or cajan is adapted to the tropics and subtropics where it is one of the most valuable legumes. It is cultivated for both forage and its edible beans, which are produced in abundance. The International Crops Research institute for the Semi-Arid Tropics (ICRISAT) has bred pigeon pea varieties and reintroduced the cultivation of this perennial legume in China. From a cultivated area of 50 hectares in 1999 in two provinces, the area under pigeon pea increased to 100,000 ha in 12 provinces in 2006.

Chinese farmers have found diverse uses from pigeon pea - prevention of soil erosion, crop diversification, fodder for cattle and feed for fishes, as a substrate for mushroom cultivation and lac production, as a vegetable, and for the preparation of food products. These uses have made pigeon pea into a multi-purpose crop with a large and diverse portfolio of uses in China.

Read the news release at <http://www.cgiar.org/newsroom/releases/news.asp?idnews=536>.

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ASIA SETS ITS SIGHT ON HIGH BETA CAROTENE TOMATOES

Tomato is an integral part of Asian and African cuisines. Only a few dishes are not without tomatoes. Because of its fame as a source of beta-carotene and lycopene, the World Vegetable Center has designed a new variety of tomato to contain three to five times more beta-carotene than regular red tomatoes. With the recent release of high beta-carotene cherry tomatoes in Taiwan, the World Vegetable Center has secured a steady supply of Vitamin A especially in deficient areas in Asia and Africa. Vitamin A deficiency is one of the scourges of the developing world, and about 25 million have become blind from preventable diseases due to lack of Vitamin A in the diet.

Aside from its nutritional and health benefits, the high beta-carotene tomato hybrid has also shown high resistance to Gemini virus and tomato mosaic virus, two of the most destructive viruses that affect tomato crops. The Center is also developing heat tolerant, disease resistant varieties that can be grown during the wetter, warmer periods without catching widespread microbial diseases.

Read the news release at http://www.avrdc.org/news/feature_tomato_2feb2007.html.

ANCIENT GENES FOR SALT-TOLERANCE IN WHEAT [Top]

Scientists at the Commonwealth Scientific and Industrial Research Organization (CSIRO) are studying two ancient genes that can provide salt-tolerance to wheat. The two genes – known as Nax1 and Nax2 work by excluding salt from different parts of the plant: one from the roots, the other from the leaves. The discovery of the two genes is the subject of international patents.

“The two genes originally came from a wheat ancestor, *Triticum monococcum*,” says CSIRO Plant Industry’s Dr Rana Munns. “They were unwittingly crossed into a durum wheat line about 35 years ago and are normally not present in any modern wheat.” The team used their knowledge of the two genes to construct molecular markers, which are now in use in CSIRO’s wheat breeding program. A durum wheat variety as salt-tolerant as bread wheat is in advanced field trials and could be commercially available in three years.

Read the news article at <http://www.csiro.au/csiro/content/standard/ps2pv.html>.

Research

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“QUICK AND DIRTY” DNA EXTRACTION METHODS IN RICE COMPARED

Researchers at the International Rice Research Institute (IRRI) in the Philippines have evaluated six methods for extracting DNA from rice seedlings. The researchers were trying to find simple and cheap methods for extracting DNA from rice seedlings to be used in marker assisted breeding programs in research institutes in developing countries.

The six DNA extraction methods that were compared include the IRRI method, which utilizes a sodium dodecyl sulfate extraction buffer followed by chloroform/isoamyl alcohol extraction, the ultra simple method, sodium hydroxide (NaOH)-Tris method, water method, proteinase K method, and TE buffer method. These methods were evaluated in terms of effectiveness for PCR amplification, yield, purity, time required and cost.

The group of D.J. Mackill observed that both the IRRI-developed extraction method and the previously published method using the NaOH-Tris worked best. However, because the NaOH-Tris method is simpler, quicker and cheaper, they recommend it over the standard IRRI method for potential use in many applications of marker assisted selection or high-resolution mapping. The IRRI method costs about \$1.375 per sample compared to just \$0.486 when the NaOH-Tris method was used.

The abstract published by the journal *Plant Breeding*, with links to the full paper for subscribers, can be accessed at <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1439-0523.2006.01272.x>.

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HORIZONTAL GENE TRANSFER FROM BIOTECH RAPESEED TO GUT BACTERIA OF BEES UNLIKELY

Bacteria from the gut of three species of bees that pollinated biotech rapeseed (*Brassica napus*) were analyzed to test if the transgene conferring glufosinate tolerance in the crop has transferred to the gut bacteria. The results of the study by researchers Kathrin Mohr and Christoph Tebbein in Germany have supported other previous assertions - that such process is unlikely.

A total of 96 gut bacterial strains were isolated from the bee species. Of the isolates, 40 percent were found resistant to 1 mM glufosinate, and 11 percent to 10 mM glufosinate. These resistant strains however, were found to have no recombinant *pat*-gene, the gene conferring herbicide tolerance, from the rapeseed. The bacteria were determined to be naturally resistant to glufosinate.

Mohr and Tebbein concluded that “the broad occurrence of glufosinate-resistant bacteria from different phylogenetic groups suggests that rare events of horizontal gene transfer will not add significantly to natural bacterial glufosinate resistance.”

The paper published by the journal *Applied Microbiology and Biotechnology* can be accessed by subscribers at <http://www.springerlink.com/content/ru6q06u274571711/>.

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INDUCTION OF MITOCHONDRIAL REARRANGEMENTS FOR CYTOPLASMIC MALE STERILITY IN CROP PLANTS

Cytoplasmic male sterility (CMS) is usually manifested by the inability of an otherwise normal plant to shed viable pollen. This trait is valuable to the hybrid seed industry, as a means of generating cross-pollinated seed, and it is also

viewed as a possible means of preventing pollen escape in transgenic crops.

A method of inducing CMS through mitochondrial DNA (mtDNA) rearrangements was described by researchers at the University of Nebraska. The group of Sally Mackenzie examined a nuclear gene called *Msh1* in tobacco and tomato. *Msh1* is believed to be involved in the suppression of mtDNA rearrangements during plant development. By disrupting the gene expression through RNA interference (RNAi), the researchers observed that CMS is induced in the transgenic plants.

Mackenzie and colleagues found out that even when the transgene segregates, it did not reverse the male sterile phenotype, producing stable, nontransgenic male sterility. Their method may help provide a means to develop novel cytoplasmic male sterile lines for release as non-GMO or transgenic materials.

The paper published by the Proceedings of the National Academy of Sciences (USA), is available for subscribers at <http://www.pnas.org/cgi/content/abstract/104/6/1766>

Announcements

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BIGMAP DATABASE ON GENETICALLY MODIFIED AGRICULTURAL PRODUCTS

The Iowa State University has founded the Biosafety Institute for Genetically Modified Agricultural Products (BIGMAP), to provide science-based analysis of the risks and benefits of genetically modified agricultural products (GMAPs). BIGMAP is developing a database of the properties of selected GMAPs, with special reference to their utility and biosafety. Development of this database into a comprehensive Knowledge Base on GMAPs is now being proposed. It is expected to focus on transformed plants and animals, their expressed traits, and their products as a means of communicating knowledge concerning their safety and utility to those who need it, including scientists, breeders, regulators, universities, industry and the public.

To participate in the Expert Consultation, to be held at Iowa State University, Ames IA, USA, on April 19-20, 2007, please contact Dr Peter Scott, Consultant, p.scott@cabi.org.

SOUTH AMERICAN REGIONAL BIOSAFETY COURSE

The Norwegian Institute of Gene Ecology (GenØk) together with the Asociación Desarrollo Medio Ambiental Sustentable (ASDMAS) is offering a capacity building course in biosafety in Lima, Peru on 19 - 24 March 2007. The course is entitled "Holistic Foundations for Assessment and Regulation of Genetic Engineering and Genetically Modified Organisms". It is designed to provide policy makers, regulators, scientists and NGOs/civil society leaders, with the necessary balanced and critical knowledge and training in crucial GE/GMO issues through lectures, laboratory demonstrations, group work on case studies, and discussions.

Further information about the course is at <http://asdmass.com/workshop>.

8TH INDIAN AGRICULTURAL SCIENCE CONGRESS 2007

The 8th Indian Agricultural Science Congress 2007 with the theme "Science for Food and Livelihood Security and Rural Prosperity" will be held on 12-17 February, 2007 in Tamil Nadu University, Coimbatore, India. The congress, organized by New Delhi's National Academy of Agricultural Sciences, hopes to address issues that will encourage entrepreneurship in agriculture in India.

More information at <http://www.tnau.ac.in/nasc/Home.htm>.

THE 2ND INTERNATIONAL CONFERENCE ON PLANT MOLECULAR BREEDING

The 2nd International Conference on Plant Molecular Breeding (ICPMB) will be held on 23-27 March, 2007 in Sanya city, Hainan province, People's Republic of China. This event will focus on applied plant genomics and molecular plant breeding in view of the increasing need to use new molecular approaches and mine novel gene resources. All important aspects of plant molecular breeding and related transgenic ecological risk and intellectual property rights (IPR) will be covered in several sessions and satellite workshops.

Registration details can be found at <http://www.icpmb.org/142.html>.

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Document Reminders

FAO DOCUMENTS ON BIOTECHNOLOGY

"Results from the Food and Agriculture Organization (FAO) Biotechnology Forum: Background and dialogue on selected issues", by J. Ruane and A. Sonnino, is now available. It provides a background and summary documents from a series of six moderated e-mail conferences hosted by the FAO Biotechnology Forum from 2002 to 2005, relating to agricultural biotechnology for the crop, forestry, animal, fisheries and agro-industry sectors in developing countries.

See <ftp://ftp.fao.org/docrep/fao/009/a0744e/a0744e00.pdf> (917 KB) or contact biotech-admin@fao.org for more information.

Another FAO document is on water scarcity and agricultural biotechnologies. It gives an overview of the current status and future perspectives regarding water availability and use, and strategies that can be employed to deal with water scarcity. It also looks into the potential ways in which biotechnology could contribute to this area. See <http://www.fao.org/biotech/C14doc.htm> or contact biotech-admin@fao.org to request a copy of the document.

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