

CropBiotech Update



INTERNATIONAL SERVICE
FOR THE ACQUISITION
OF AGRI-BIOTECH
APPLICATIONS

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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GENES REVEAL THE EPIC JOURNEY OF MAIZE

How did maize become ubiquitous and widespread? From the warm climes of Spain to the cold, short day-lengths of Germany, from Nigeria to the Caribbean, maize can be found everywhere. Recent work by CIMMYT and partners sheds new light on maize's global migration. Scientists have used DNA markers and new approaches to analyze close to 900 populations of maize and its ancestor, teosinte, from around the world.

The studies corroborate the notion that northern European maize originates from North American varieties brought to the continent several decades after Columbus' return, and definitely not from tropical genotypes. Temperate maize spread further north and east across North America, while tropical maize spread south. The two maize types are now so different from each other that they do not cross well, and their hybrids are not well adapted anywhere. The work

on elucidating the epic journey of maize continues, and will one day help breeders design maize varieties with attractive traits, taking advantage of the vast gene pool of maize.

Read the news article at <http://www.cimmyt.org/english/wps/news/2007/may/amazingmaize.htm>.

AFRICA

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ANALYSIS OF FOOD SUPPLY, UTILIZATION IN GHANA

A study by the University of Ghana showed that the food supply per person in the country dropped by almost 30% during 1969 to 1983. During the same period, the annual total agricultural production in Ghana declined by almost 1%, reports Samuel Codjoe, who conducted the research. The decline in production was influenced by various factors including population growth, and the utilization of some food crops as feed.

Codjoe used data from the Food and Agriculture Organization and the Ghana Ministry of Food and Agriculture Census. He described that although food production has tripled in most developing countries in the last 30 years, an opposite scenario is evident in those located in sub-Saharan Africa.

To read more and download the paper published by the African Journal of Food Agriculture, Nutrition and Development, please visit <http://www.ajfand.net/Issue13/PDFs/Codjoe-1815.pdf>.

MAIZE FARMERS IN ZIMBABWE NEED KNOWLEDGE OF OPEN-POLLINATED VARIETIES

Small-scale maize farmers in Zimbabwe are not taking advantage of open-pollinated maize varieties (OPVs) because of their limited knowledge about OPVs, according to a new study assessing the effectiveness of a large-scale maize seed relief effort in Zimbabwe during 2003-07. Many farmers continue to recycle hybrids, improperly select OPV grain for future use as seed, or, in the worst cases, eat all their grain and hope for another aid shipment to sow next year.

Hybrid maize varieties normally yield more than OPVs, but "recycling" the seed in subsequent seasons will result in a significant loss in yield and of agronomic advantages. Unlike hybrids, grains of OPVs can be sown the following year without the yield or other qualities of the variety diminishing substantially. However, only a few farmers were ever taught how to properly select or store their seed of OPVs. An effort to introduce OPV seeds and train farmers in seed selection has been in place under the seed aid program funded by British Department for International Development (DfID), and coordinated by the Food and Agricultural Organization (FAO) regional office in Harare.

The news article is available at <http://www.cimmyt.org/english/wps/news/2007/may/smallholder.htm>.

EFFORTS TO HALT CASSAVA AND BANANA DEVASTATION IN EAST AND CENTRAL AFRICA GAIN MOMENTUM

The Crop Crisis Control Project (C3P) has been reaping rewards from its efforts to mitigate the effects of cassava mosaic virus disease and banana *Xanthomonas* wilt (BXW) in six countries of East and Central Africa - Burundi, Democratic Republic of Congo (DRC), Kenya, Rwanda, Tanzania, and Uganda. According to the quarterly report of the Project, a total of 706.5 hectares – a 30% increase over the C3P target - of cassava-resistant materials are in production across the six countries.

Cassava and banana constitute the main staple food for about half of the population in East Africa. The International Institute of Tropical Agriculture (IITA) has developed several improved cassava varieties resistant to CMD and other diseases. The varieties are drought-resistant, early maturing, high yielding, and low in cyanide content.

The news article is available at http://www.iita.org/cms/details/news_details.aspx?articleid=1049&zoneid=81.

AMERICAS

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STRATEGIC APPROACHES TO INFORMING PUBLIC ABOUT BIOTECH

To offset poor public perception of biotechnology in Latin America and the Caribbean countries, a strategic plan for public communications is required. This is particularly important where the benefits of biotechnology products are not clearly evident to consumers. This observation is forwarded by Patricia Traynor of New Agritech Strategies in Virginia, USA and colleagues from the University of Chile in a paper published in the Electronic Journal of Biotechnology.

In "Strategic approaches to informing the public about biotechnology in Latin America", the authors enumerate specific objectives for this initiative: (1) make evident to decision makers that modern biotechnology can be an effective tool for increasing agricultural productivity, and thereby economic growth, without imposing unacceptable risks to the environment or to human and animal health; (2) enable members of the public to make informed decisions about appropriate uses of biotechnology by providing accurate information about benefits, risks and impacts; or (3) incorporate modern biotechnology into science curricula for secondary schools, university and college students, and agriculture extension officers.

The authors conclude that governments, industry, universities and media must play an important role in improving public perception about biotechnology in the Region.

Read the full paper in <http://www.ejbiotechnology.info/content/vol10/issue2/abstract/12/index.html>.

NEW SCREENING METHOD TO FIND BETTER BIOFUEL CROPS

Researchers at the U.S. Department of Energy's Ames Laboratory are looking at a novel way to help them determine what type of plant material offers a more cost effective and sustainable biofuel crop. Emily Smith, analytical chemist and Iowa State University assistant professor of chemistry, plans to develop a simplified version of the Raman imaging to study plant cell structure. This would determine which crops offer the right combination of cell wall composition and degradation to maximize the materials' conversion to ethanol.

"Just like vintners who monitor and test the sugar content of their grapes in the field, biofuel producers could potentially use this technology to determine if their crop was at optimal development for conversion to ethanol," said Smith. She added that the method needs very small pieces of plant material and thus multiple samples can be analyzed quickly.

See the press release at http://www.ameslab.gov/final/News/2007rel/Raman_imaging.html

ALTERNATIVE METHOD TO INTRODUCE GM MATERIAL INTO PLANT

Scientists at Rutgers, the State University of New Jersey, suggest an alternative and safer approach to introduce genetic material into a plant, and to solve the problem of genes escaping into the environment. In a paper published in the Proceedings of the National Academy of Science, Pal Maliga and Zora Syab propose implanting the genes into the plastid where the risk of escape is minimized, instead of the cell nucleus.

"Our work with a tobacco plant model is breathing new life into an approach that had been dismissed out-of-hand for all the wrong reasons," said Maliga. "Introducing new agriculturally useful genes through the plastid may prove the

most effective means for engineering the next generation of GM crops.”
Contact Joseph Blumberg at blumberg@ur.rutgers.edu for additional information.

BAYER CROPSCIENCE TO ACQUIRE US COTTON SEED COMPANY STONEVILLE FROM MONSANTO

Bayer CropScience recently announced its future acquisition of Stoneville Pedigreed Seed Company, a leading US provider of cotton seeds, from Monsanto Company. This purchase is expected to enhance the fast-growing US cotton seed business of Bayer CropScience, currently the second largest cotton seed supplier in North America.

In acquiring the US assets of Stoneville, Bayer CropScience will gain access to additional high performing cotton products with insect-resistant and herbicide-tolerant Monsanto traits. However, the acquisition does not include Stoneville's NexGen™ franchise, a regional cotton seed business in Texas, and other assets related to the NexGen business.

Read the news release at http://www.bayercropscience.com/bayer/cropscience/cscms.nsf/id/20070529_EN?open&ccm=400.

DESIGNING EDIBLE FILMS FROM MILK AND BIOFUEL BYPRODUCTS

Scientists at the United States Department of Agriculture Agricultural Research Service (ARS) have developed a method that uses byproducts, not only from dairy processing, but also from biofuel production, to create biodegradable protective films. The water-resistant film was made from the milk protein casein, water, and glycerol, a byproduct of biofuel production. Carbon dioxide was used to isolate dairy proteins from milk, instead of harsh chemicals or acids. Using CO2 makes the film more water-resistant and biodegradable. The resulting food coatings are glossy, transparent and completely edible.

The news article is available at <http://www.ars.usda.gov/News/docs.htm?docid=1261>.

EPA APPROVES NON-COTTON REFUGE FOR BOLLGARD II COTTON

The United States Environmental Protection Agency (EPA) has approved a natural refuge option for Monsanto's Bollgard II cotton planted from Texas east, excluding some Texas counties. Cotton producers in the eligible regions can use non-cotton crops and other plants as a refuge for certain pests, and will not be required to plant a non-Bt cotton refuge for Bollgard II cotton.

Monsanto requested a natural refuge for Bollgard II cotton after collecting extensive scientific data to show that a sufficient number of cotton bollworms and tobacco budworms, key pests controlled by Bollgard II cotton, are present on non-cotton crops and other plants. The natural presence of these pests outside of cotton, combined with the dual efficacy of Bollgard II cotton, greatly reduces the chance that these pests will develop resistance to Bollgard II cotton.

To read more: <http://monsanto.mediaroom.com/index.php?s=43&item=495>.

DUPONT TECHNOLOGIES TO ADDRESS GLOBAL DEMAND FOR GRAIN; NEW TRAITS IN THE PIPELINE

At a recent conference in New York, DuPont Vice President for Crop Genetics Research & Development William S. Niebur said the company's technologies are helping meet the strong global demand for grain that is driven by a growing global population and increased biofuels use. Niebur unveiled four new traits in the crop genetics pipeline from DuPont:

- Optimum™ GAT™ herbicide resistance trait will give farmers new weed control options and help boost yields in

soybeans.

- Increased soybean yield through molecular marker technology and biotechnology advances.
- Disease resistance for corn that will protect the corn plant from stalk rot.
- Soybean oil that will reduce trans-fats, creating an oil that is more stable under frying applications.

Read the press release at <http://www.pioneer.com/web/site/portal/menuitem.8ff75ac1f33ef1cfa3869fd2d10093a0/>.

ASIA AND THE PACIFIC

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SCIENTISTS IN CHINA DEVELOP NEW QTL MAPPING METHOD TO FIND GENES

Biotechnology has long promised to facilitate breeders' work, also through methods that provide breeders with information about the crop genes associated with physiological traits of importance. This information is relatively simple to obtain for traits governed by only one or two genes in the plant. However, when it comes to traits that have a more complex genetic basis, such as yield potential or drought tolerance, classical Mendelian rules of inheritance simply do not apply very well to them.

To solve this problem, geneticist Jiankang Wang with the International Maize and Wheat Improvement Center (CIMMYT), along with colleagues at the Chinese Academy of Agricultural Sciences (CAAS), have developed a new mapping method and software for quantitative trait loci (QTL), which are segments of a plant's DNA associated with areas where one important gene or a concentration of several genes that contribute to physiological traits of interest can be found.

"The newly-developed QTL mapping method and software will help breeders use genetic data from CGIAR centers and national agricultural research systems to mine novel genes, acquire more complete genetic knowledge for quantitative traits of interest, and conduct efficient genotypic selection," says Wang. "Farmers will benefit from having higher yielding, more disease resistant, and more drought tolerant rice, maize, and wheat varieties with better grain quality."

<http://www.cimmyt.org/english/wps/news/2007/may/genefinders.htm>

WILD RELATIVES OF SUGARCANE SWEETEN BREEDING PROGRAM

Imported clones from China produced from crosses between sugarcane and three wild relatives of sugarcane are now available to Australian sugarcane breeding programs. These clones could widen the otherwise limited genetic base of commercial sugarcane varieties, which are based on a small number of clones from crosses between *Saccharum spontaneum* (a wild cane species) and *Saccharum officinarum* (the original sugarcane used in agriculture).

"We want to evaluate the yield potential and performance of progeny from crosses between these clones and the best parents from Australian breeding programs", says Dr Philip Jackson, key researcher in the project that seeks to breed better sugarcane varieties for Australia. "We are especially interested in performance in dry environments and ability to re-shoot or 'ratoon'." Crossing started two weeks ago at Macknade experiment station in North Queensland, and seedlings from the crosses will be grown in the next few months.

The news article is available at <http://www.csiro.au/news/WildRelativesForSugarcane.html>.

LOOKING FOR SOLUTION TO THE RICE VIRUS DISEASE PROBLEM IN THE MEKONG DELTA

Rice production in Vietnam, particularly in the Mekong Delta, has suffered major setbacks when outbreaks of virus

diseases carried by the brown planthopper (BPH) caused significant losses in rice yields. Extensive outbreaks of BPH were also reported in China, Korea, and Japan. Vietnamese and IRRI scientists, with the support of the Australian Centre for International Agricultural Research (ACIAR), will undertake an 8-month project to obtain information needed for the development of an integrated management of the BPH/virus problem. The initiative will review the literature, historical data, and reports, and it will collect preliminary data to scope for research and implementation issues in order to provide some understanding of the vector-virus relationships, vector migrations, and vector variability. The project will also explore farmers' and extension workers' perceptions of viral diseases and their management.

Read the news article at <http://bulletin.irri.cgiar.org/bulletin/2007.22/default.asp>.

REGULATORY OFFICE SEEKS COMMENTS ON RISK ASSESSMENT FOR GM COTTON

Australia's Office of the Gene Technology Regulator is currently assessing license application from Deltapine Australia Pty Ltd to intentionally release genetically modified (GM) cotton into the environment. The application proposes the limited and controlled release of up to four insect resistant and insect resistant/herbicide tolerant GM cotton lines over a three year period (2007-2010). The trial would involve early stage research to evaluate the agronomic performance and efficacy of the GM cotton lines; collect data for other regulatory approvals; breed, select, and test new cotton lines; and produce seed for further trials, subject to additional approvals. The Regulator welcomes comments on a risk assessment and risk management plan (RARMP) for the proposed release of GM cotton until July 13, 2007.

For more information, visit <http://www.ogtr.gov.au> and <http://www.ogtr.gov.au/rtf/ir/dir073notifcon.rtf> or contact ogtr@health.gov.au.

ALTERNATIVE SELECTION SYSTEMS FOR PLANT TRANSFORMATION

Alternative selection systems for plant transformation are especially valuable in clonal crops, such as potato (*Solanum tuberosum*), to pyramid transgenes into the same cultivar by successive transformation events. Because of the concern about escape of antibiotic- or herbicide-resistant transgenes from transgenic crops, selectable marker genes from plant origin would be valuable alternative choice for plant transformation.

Syamsidah Rahmawati from Research Centre for Biotechnology, Indonesia, has conducted research on alternative selectable gene for plant transformation, and she found four alternative selection systems that are potentially safe and effective in plant transformation system. Two systems, phosphomannose isomerase (PMI) and xylose isomerase (Xyla), used mannose and xylose, respectively, as selective agents. Furthermore, Xyla has been widely used in the starch industry and in food processing.

To download the full article of "Alternative Selectable Marker Gene for Plant Transformation", visit http://www.indobiogen.or.id/terbitan/pdf/agrobio_6_1_26-33.pdf.

EUROPE

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EU OPENS DOORS TO GM CARNATIONS FROM AUSTRALIA

Florigene, an Australian company that breeds flowers using genetic modification, got the go signal to market genetically modified carnations and to sell them as cut flowers in the European Union (EU) for 10 years. The approval, which does not allow cultivation of the plant, was made by the EU Commission on the basis of a safety assessment by the European Food Safety Authority.

The carnation, named Moonlite, contains petunia genes that provide the blue color. It will be available in European flower shops as soon as Florigene provides a detection method and a label or document that identifies the flowers as GM.

The full story is at <http://www.gmo-compass.org/eng/news/messages/200706.docu.html#124>.

EXETER SCIENTISTS EXAMINE ROLE OF WIND IN GM CROSS-POLLINATION

A research team from the School of Biosciences, University of Exeter, has recommended a new method for predicting the potential of cross-pollination between genetically modified (GM) and conventional crops. The method takes into account wind speed and direction to predict the movement of pollen in the air. Their study shows huge variation in the amount of cross-pollination between GM and non-GM crops of maize, oilseed rape, rice and sugar beet. Levels vary according to whether the GM field is upwind or downwind of the non-GM field given the direction of the prevailing wind over the flowering period of the crop. This model of pollen dispersal in the wind can be used to devise minimum distances between GM and conventional crop that minimize cross-pollination.

Readers can access the article at <http://www.exeter.ac.uk/news/newscrop.shtml>.

GERMANY: LARGE-SCALE TRIAL OF GM POTATOES APPROVED

Large-scale field trials (155 hectares) of the genetically modified potato Amflora have been approved by the German Federal Office of Consumer Protection and Food Safety (BVL). The GM potato developed by BASF Plant Science produces only potato starch composed solely of amylopectin. Previously, small-scale field trials with Amflora potatoes already were approved in the Netherlands, the Czech Republic, Sweden, and Germany. BASF has applied for approval of commercial cultivation and industrial use of the Amflora potato in the European Union. The safety assessment has been completed but an approval decision by the EU is still pending.

More information at <http://www.gmo-compass.org/eng/news/messages/200706.docu.html#123> and http://www.bvl.bund.de/cln_007/nn_491652/DE/08_PresseInfothek/01_InfosFuerPresse/01_PI_und_HGI/GVO/amflora_freisetzung.html.

Research

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BT TOMATO WITH CRY6A FOUND RESISTANT TO ROOT-KNOT NEMATODES

Transgenic tomato plants expressing modified *Bacillus thuringiensis* (Bt) *cry6A* genes were found to have increased resistance to the root-knot nematode *Meloidogyne incognita*. This is the first time that a Bt Cry protein was demonstrated to confer plant resistance to an endoparasitic nematode, and that Cry proteins are reported to have the potential to control plant-parasitic nematodes in transgenic plants.

Researchers at the University of California tested two *cry6A* genes – one was modified not to have codons (sets of three DNA bases that code for an amino acid) uncommon in plants, and the other altered to include only optimal codons for each amino acid based on studies in *Arabidopsis*. The researchers report that there was a fourfold decrease in progeny production of the nematode pest brought about by *cry6A* expression in the plants. They recommend that *cry6A* be 'stacked' in crop varieties with other nematode-resistant traits.

The paper, published by the Plant Biotechnology Journal, can be accessed at

<http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-7652.2007.00257.x>.

ENGINEERING PAPAYA WITH CBF GENES FOR COLD TOLERANCE

Papaya is sensitive to frost and its production in subtropical regions can be affected by low temperatures that occur in these regions. Understanding the mechanism of cold tolerance in the crop will help crop breeders develop varieties that are tolerant to low temperatures.

Researchers at the University of Florida and Fort Valley State University in the US are using genetic engineering and genomic approaches to determine if genes from *Arabidopsis* will increase the cold tolerance of papaya. They have introduced two transgenes belonging to the C-repeat binding factor (CBF) gene family. CBF genes were observed to increase stress tolerance by promoting expression of cold-regulated (COR) genes in transgenic tomato.

The papaya genome was determined not to have any related DNA sequences to the CBF genes based on results of PCR analysis. The researchers concluded that papaya may also not have any cold inducible sequences. However, they speculate that the introduced CBF genes might induce other stress-inducible endogenous genes in papaya.

The paper published in the journal *In Vitro, Cellular and Developmental Biology (Plant)* can be accessed by subscribers at <http://www.springerlink.com/content/dv0672p947268724/>.

APPLICATIONS OF TREHALOSE IN PLANT BIOTECH REVIEWED

Trehalose is a type of sugar that has been shown to help plant and animal cells withstand desiccation. Studies in plants have shown that the compound is also associated with increased tolerance to abiotic stresses, such as drought and salinity. Therefore, ways to manipulate the trehalose metabolism are being investigated.

Researchers in Europe reviewed possible genetic engineering approaches for increasing trehalose accumulation which may help in the development of drought and salinity tolerant plant varieties. One approach, said the researchers, is to obtain transgenic plants that over-express genes coding for enzymes in the trehalose biosynthetic pathway. Another approach is to inhibit the expression of the gene coding for trehalase. Trehalase degrades trehalose into two molecules of glucose. With the trehalase genes already cloned from plants, research exploring the feasibility of this method is expected to increase in the future.

Read the review paper at
<http://www.springerlink.com/content/rgp1v9521618h75g/>.

Announcements

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PLANT BREEDING NEWS (PBN-L)

PBN-L is a free monthly e-newsletter for applied plant breeding and related fields, and a component of the Global Partnership Initiative for Plant Breeding Capacity Building (GIPB). PBN-L is sponsored by FAO-AGPC and the Department of Plant Breeding Genetics, Cornell University. To subscribe, email mailserv@serv.fao.org leaving the subject line blank, and writing SUBSCRIBE PBN-L in the message text.

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Document Reminders

SLI REPORT ON GROWING GM CROPS IN SWEDEN

The Swedish Institute for Food and Agricultural Economics (SLI) is a public institution devoted to the advanced economic analyses within the fields of agriculture, foods and fishing. SLI has recently published a report that compares the production of genetically modified crops with the production of conventionally grown crops in Sweden in a business perspective.

The report (in Swedish), and the summary of the study (in English) are available at http://www.sli.lu.se/eng_item_detail.asp?activity_id=112

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