

CROPBIOTECH UPDATE

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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FLOOD-TOLERANT RICE DEVELOPED

Research teams from the International Rice Research Institute (IRRI) in the Philippines and the University of California's Davis and Riverside campuses have discovered a rice gene that allows the crop to survive complete submergence in water, with no compromise to yield. This discovery will pave the way to the development of rice varieties that can withstand flooding, a common problem in many rice-growing countries.

Although rice is grown in standing water, it will die if it is completely submerged for more than a few days. However, weed populations decreased if rice is left in water. The isolated gene, designated *Sub1A*, can therefore buy farmers time and reduce herbicide use. The research team is now trying to identify all the genes that are regulated by *Sub1A*, to use this information to further improve tolerance to flooding and other stresses.

For information, please contact: Duncan Macintosh, email d.macintosh@cgiar.org. More information is available in the Research section of this issue of the Crop Biotech Update.

BIOTECH TOBACCO FOR THE PRODUCTION OF HIV PREVENTION CREAM

AIDS (Acquired Immunodeficiency Syndrome), a sexually transmitted disease, is a global health problem of epidemic proportions. In Sub-Saharan Africa alone, an estimated 24.5 million people were living with AIDS at the end of 2005, and approximately 2.7 million new infections occurred during that year. AIDS is caused by the Human Immunodeficiency Virus (HIV), which leads to the devastation of the immune system.

The best protection against HIV is the use of condoms. However, women cannot always ensure their partners use adequate protection. Dr. Julian Ma and his team of researchers, of St George's University of London, are working on developing an additional barrier to HIV infection: a vaginal cream that prevents transmission of the virus if applied twice a week. The active ingredient in the cream is the microbicide Cyanovirin-N (CV-N), which inactivates an extensive range of HIV strains. Initial clinical trials of the cream on monkeys have provided very encouraging results, and the team hopes to conduct human trials in the next three years.

However, for the new treatment to make a significant global health impact, particularly in developing countries, it is essential to produce the microbicide cheaply and in large supplies. As conventional production systems do not meet these requirements, Dr. Ma has turned to transgenic tobacco plants as alternative pharmaceutical “factories” for the large-scale production of CV-N. The team is currently investigating the scale-up of cultivation of transgenic plants, in sealed containment greenhouses in the UK.

For more information, contact Dr. Julian Ma at: jma@sgul.ac.uk

INTERNATIONAL CONSORTIUM SEQUENCES GENOME OF FOREST FRIENDLY FUNGUS

An international consortium of research teams from France, the United States, Belgium, Germany, and Sweden have elucidated the genomic sequence of the soil fungus *Laccaria bicolor* (commonly known as bi-colored deceiver). *L. bicolor* establishes mutually beneficial symbiosis with tree species in natural and in agro-forestry ecosystems, aiding its host in the absorption of nutrients and minerals of the soil, in exchange for a home and for carbon sources from the tree. *L. bicolor* is used in large-scale commercial inoculation programs in forest nurseries worldwide to promote the growth of tree seedlings.

L. bicolor is the first symbiotic fungus to be sequenced, and the information obtained from the 65 million base pairs distributed in 10 pairs of chromosomes, encoding 20,000 genes, will provide important insights into the genetic basis of plant-fungal interactions.

To find out more, visit <http://genome.jgi-psf.org/Lacbi1/Lacbi1.home.html> or http://www.inra.fr/presse/sequencage_laccaria_bicolor, or write to Francis Martin (fmartin@nancy.inra.fr).

CROSS-CONTINENT SURVEY ON GM FOOD CONDUCTED

About 62% of South Africans and 43% of Singaporeans who are familiar with genetically modified (GM) foods are accepting of the technology, as long as it makes food taste better. This is one of the findings of a recently concluded survey by Synovate, a global market research company, which surveyed 3,127 respondents in Greece, Indonesia, Poland, Singapore, and South Africa.

Other findings of the survey include the following: 1) 84% of Greeks and a majority of respondents in South Africa and Poland are familiar with GM foods, while 92% of Indonesians and 65% of Singaporeans are not familiar with the

term; 2) among the consumers who are aware of GM foods, 89% of those from Greece, 68% from Poland, 59% from Singapore, 66% from Indonesia, and 33% of South Africans believe they may be harmful; and 3) despite these cautious feelings, 46% of Indonesians, 45% of South Africans, and 42% of Poles and Singaporeans believe that the benefits of GM foods outweigh the risks.

For more information on Synovate, visit <http://www.synovate.com>. Read the press release at <http://www.synovate.com/current/news/article/2006/08/gm-foods-8211-delight-or-fright.html>.

*** AFRICA ***

AFRICA RICE CONGRESS YIELDS RESOLUTIONS ON FOOD SECURITY

Rice should be one of the cornerstones of a Green Revolution for Africa, and this can be achieved through a new and better capacity-building program focusing on the development of a multi-disciplinary cadre of scientists. In line with this, equal attention should be urgently given to four areas: policy, capacity building, technology development and transfer, and infrastructure. This was one of the resolutions reached at the recently concluded Africa Rice Congress in Dar es Salaam, Tanzania.

Other resolutions were adopted, among them measures to accelerate farmer adoption of New Rices for Africa (NERICA) varieties and other improved technologies through concerted actions by a broad partnership, including governments, research institutions, NGOs, the private sector, and local, regional, and international organizations. The Congress participants also urged African governments to support their rice farmers, instead of becoming increasingly dependent on external supply for rice.

Leading scientists attending the Congress also mentioned that new farming technologies being introduced to the continent benefited mainly men, many of whom had left their rural homes for urban centers. Dr Tunji Akande, a rice policy analyst, said the scenario has adversely affected the production of rice in countries like Kenya, where more than 60% of labor in rice fields are provided by women.

The congress was organized by the Africa Rice Center (WARDA). About 175 participants from all over the world, particularly from West, East, and Central Africa, attended. With reports from <http://allafrica.com/stories/200608040086.html> and <http://allafrica.com/stories/200608070373.html>. Read the press releases at <http://www.warda.org/warda/newsrel-congress2-aug06.asp>, <http://www.warda.org/warda/newsrel-congress-aug06.asp>, and <http://www.cgiar.org/newsroom/releases/news.asp?idnews=443>.

ETHIOPIA, U.S. SIGN GRANT AGREEMENT

Ethiopia and the United States have signed a grant agreement in support of ongoing U.S.-Ethiopian partnership programs under USAID. The agreement was signed by Mekonnen Manyazewal, Ethiopia's State Minister of Finance and Economic Development, and Glenn Anders, USAID Mission Director, and amounts to US\$ 57.6 million.

USAID partnership programs in Ethiopia are carried out to reduce vulnerability to disease, improve quality of primary education, ensure food security, and end poverty and hunger. About US\$ 15.6 million of the grant will be used to fund existing and new programs promoting market-led economic growth, particularly in the food, livestock, and agriculture sectors.

Read the complete news, and other articles related to Ethiopia, at <http://www.ena.gov.et>.

UGANDA TRADE SHOW SPEAKERS CALL FOR RESEARCH SHARING

Hilary Onek, Uganda's Minister of Agriculture, has called on local research bodies to share their output and results with farming communities in order to increase the country's agricultural productivity. He announced this as he presided over the closing ceremonies of the 14th Source of the Nile Agricultural and Trade Show, held recently in Jinja, Uganda.

State Minister for Agriculture in Charge of Animal Industry, Maj. Bright Rwamirama, was also at the same function. He said that displays at the show had proved that good research has been conducted, and what remains is for farmers to be given information and resources to allow them to engage in farming as a business.

With reports from <http://allafrica.com/stories/200608010182.html> and <http://allafrica.com/stories/200607240313.html>.

*** THE AMERICAS ***

LEUCENA BOOSTS MAIZE YIELDS IN MIXED FIELDS

Leucaena leucocephala, a fast-growing perennial shrub from Central America, is the most widely cultivated tropical legume, and provides the highest quality feed of any tropical legume. Legumes have the ability to fix atmospheric nitrogen, an essential agricultural nutrient, through their symbiotic interaction with beneficial bacteria known as Rhizobia. *Leucena* is able therefore to provide up to 500 kg/hectare/year of nitrogen to a field. In addition, the tropical legume also has the ability to interact with soil fungi for an improved uptake of additional essential nutrients and minerals.

Researchers of the Brazilian Agricultural Research Corporation (EMBRAPA) have investigated the effect on the productivity of maize crops when leucena shrubs are planted intercalated among the maize plants. The result: Up to 200% increase in production in the absence of added chemical nitrogen fertilizers, compared to plantations of only maize.

According to Israel Alexandre Pereira Filho of EMBRAPA, this finding has important implications for small-scale, resource-poor farmers, as it would significantly lower the costs of production. In addition, excess, unabsorbed chemical nitrogen fertilizers are a major source of agricultural pollution as they contaminate water supplies, so a mixed cultivation strategy would also be very beneficial to the environment.

Read more (in Portuguese) at:

http://www.embrapa.br/noticias/banco_de_noticias/folder.2006/agosto/foldernoticia.2006-08-01.3121836454/noticia.2006-08-03.3290835854/mostra_noticia

PERUVIAN FARMERS HEAVY PESTICIDE USERS, STUDY FINDS

Farmers in Peru are damaging to their health, and that of their families, by using toxic pesticides without proper protection. This is one of the findings of a study by the International Potato Center (CIP): Persistent Organic Pollutants (POPs) Pesticides in Andean Farming Communities in Peru. The project was funded by the Canadian POPs Fund through the World Bank, and research was conducted in five areas in Peru previously selected as hotspots of pesticide use.

Findings of the study include the following: 1) Farmers are still using hazardous pesticides, including Temik, an extremely hazardous chemical that has been the cause of many deaths and severe bouts of poisoning in many areas of Peru; 2) Some pesticides that are now being used in Peru should be applied only when wearing extensive protection, but farmers with limited resources and education

have no access to this information, and are thus unaware of the risks; and 3) Farmers frequently have direct contact with pesticides, but often do not understand the meaning of hazard colors on pesticide labels. One solution is integrated pest management (IPM), the CIP mentions in its press release; IPM's main objective is to reduce the excessive use of pesticides to achieve a more sustainable agriculture.

Read the complete press release at http://www.cipotato.org/news_more.asp?cod=26.

*** ASIA AND THE PACIFIC ***

INDONESIA, AUSTRALIA CONSUMER PERCEPTION SURVEYS CONDUCTED

Australians and Indonesians have similar attitudes toward genetically modified (GM) foods. This was the conclusion of a recently-conducted survey of consumer perceptions of GM foods, led by Marthin G. Nanere of La Trobe University, Australia; Asep Saefuddin of Bogor Agricultural University, Indonesia; and Emmanuel Yiridoe from Nova Scotia Agricultural College, Canada.

The researchers conducted the surveys from October 2005-February 2006. Data from 635 respondents showed around 70% of Indonesians and 56% of Australians were willing to consume GM foods if these foods reduced pesticides use. Moreover, around 80% of Indonesians and close to 70% of Australians were willing to consume GM foods if these foods were more nutritious than their non-GM counterparts. The study also found that ethical and religious concerns are apparently more important in Indonesia than in Australia in explaining consumer attitudes toward GM foods.

For more detail information, please send email to Asep Saefuddin, PhD at wakilrektor4@ipb.ac.id.

VIETNAM'S SCIENTIFIC ORGS TO OPERATE BUSINESS VENTURES

Ten ministry research institutes and five scientific and technological organizations in Vietnam have been selected to operationalize a pilot project that will introduce organizational reforms to encourage income generating activities. These agencies will operate like a business – from taking out loans, covering operational costs, making investments, and engaging in joint ventures with foreign companies. They can also engage in production, selling, and exporting of products that are produced from the research they do.

Dang Kim Son, Director of the Institute for Agricultural and Rural Development Policy and Strategy, says that the new model would enable organizations to provide better salaries for its staff as well as improve working conditions to attract more talents.

For more news from Vietnam, email Le Hien of BiotechVn at lehen@aqbiotech.com.vn.

CSIRO DEVELOPING INSECT RESISTANT COWPEAS FOR AFRICA

Australia's CSIRO Plant Industry is developing insect resistant cowpeas using biotechnology to address a major protein food crop requirement for Sub-Saharan Africa. Scientists led by Dr. TJ Higgs are working on a system to introduce new Bt genes to provide protection against pod borers in cowpeas, a serious pest that can reduce yield by more than 80 percent.

CSIRO Plant Industry has already developed good gene transfer systems for legumes such as peas, chickpeas, and lupins. Thus, they were approached by the Network for Genetic Improvement of Cowpeas Africa to work on the crop. The research currently being done is supported by the African Agricultural Technology Foundation, with grants from the Rockefeller Foundation.

Aside from developing improved breeding material, CSIRO Plant Industry aims to transfer the technology to Africa. An African scientist has visited the Canberra-based group and was able to reproduce the system. Other trainees are expected to ensure that sub-Saharan nations will be able to use this technology.

Additional information on the CSIRO project is available at http://www.pi.csiro.au/enewsletter/PDF/PI_info_Cowpeas.pdf

RESEARCH

RICE GENE MAKES CROP FLOOD-TOLERANT

When plants are submerged in water, they automatically turn on a variety of responses that enhance their survival. But if they are submerged for too long, they wilt and die. Rice is no different: Even as rice is grown in water, young plants are often affected by annual flooding of low-lying agricultural lands. Some cultivars, however, are highly tolerant, and can survive up to two weeks of

complete submergence due to a major quantitative trait locus designated *Submergence 1 (Sub1)*.

But how exactly does *Sub1* work? Kenong Xu and colleagues of the International Rice Research Institute (IRRI) in the Philippines, and the University of California's Davis and Riverside campuses, analyze the components of the *Sub1* locus, and find that "*Sub1A* is an ethylene-response-factor-like gene that confers submergence tolerance to rice." Their findings are published in Nature.

In analyzing the gene, scientists found that the *Sub1* locus is actually composed of three genes from the ethylene-response-factor (ERF) family, which comprises proteins that function in allowing plants to cope with plant stress. The first, *Sub1A*, they found, is variable but required for submergence tolerance; and, when over-expressed in rice, the *Sub1A* gene allows the rice varieties to tolerate submergence in water. A variant, *Sub1A-1*, was found only in submergence-tolerant rice; while *Sub1A-2*, differing from *Sub1A-1* by a single nucleotide change, was the submergence-intolerant version of the gene. When introduced to the submergence-intolerant rice variety Swarna, which lacks *Sub1A*, scientists found that resulting rice plants were not only tolerant of being submerged in water, but also produced high yields and retained other beneficial crop qualities.

This success in characterizing the *Sub1A* gene demonstrates the value of having a high-quality reference sequence from a single plant cultivar for accurate detection of genetic variation. Knowledge of the sequence of specific genes and their associated variants will also enable researchers to tap into the natural genetic variation in a wide collection of rice germ lines. Development of submergence-tolerant varieties using these procedures is at an advanced stage for Laos, Bangladesh, and India, and has already been reported in Thailand.

Subscribers to the journal can read the complete article at <http://www.nature.com/nature/journal/v442/n7103/full/nature04920.html> and its corresponding commentary at <http://www.nature.com/nature/journal/v442/n7103/full/442635a.html>. Other readers can access the abstract at <http://www.nature.com/nature/journal/v442/n7103/abs/nature04920.html>

BEAN GENE WORKS FOR CMV RESISTANCE IN OTHER PLANTS

To protect themselves against pathogen invasion, plants make use of specific resistance (R) genes. Studies have shown that the R proteins interact with pathogen elicitors, triggering a cascade of defense responses that eventually lead a pathogen to be confined within the initial zone of infection. This localization of infection protects a plant from further damage by the pathogen.

How unique are these resistance genes? Can they function only in certain plants, and not in others? Young-Su Seo and colleagues of University of California, Davis report that “A viral resistance gene from common bean functions across plant families and is up-regulated in a non-virus-specific manner” in the latest issue of the Proceedings of the National Academy of Science, USA.

Researchers identified viral response genes in common bean undergoing defense response to viral infection, and selected a gene designated as *RT4-4* for further analysis. They introduced *RT4-4* to *Nicotiana benthamiana*, and screened transgenic plants for resistance to bean dwarf mosaic virus (BDMV), cucumber mosaic virus (CMV), bean common mosaic virus (BCMV), bean yellow mosaic virus (BYMV), and tobacco mosaic virus (TMV). Researchers found that most plants, whether transgenic or non-transgenic, developed disease symptoms typical to BDMV, BCMV, BYMV, or TMV. However, transgenic plants developed systemic necrosis, a resistance-response, when infected with seven strains of CMV from pepper or tomato, but not a CMV from bean. Researchers traced the response to *RT4-4* activity by detecting resistance responses in CMV-challenged leaves of transgenic tobacco plants. They also identified the *CMV 2a* gene product as the elicitor of the necrosis response. The approach holds promise, the researchers write, for providing insights into the mechanisms by which plants activate resistance responses against pathogens.

Subscribers to PNAS can read the complete article at <http://www.pnas.org/cgi/content/full/103/32/11856>. Non-subscribers can read the abstract at <http://www.pnas.org/cgi/content/abstract/103/32/11856>.

RING MUTANT WINS DROUGHT WAR

The RING, or Really Interesting New Gene, zinc-finger proteins are known to function in gene regulation and development. A large number of RING zinc-finger protein genes are present in the Arabidopsis genome, suggesting that such proteins are important for plant growth and development. But what do RING zinc-finger proteins do?

Scientists from Michigan State University take a look at the *XERICO* gene, which codes for RING zinc-finger protein, and which has been found to be induced by salt and osmotic stress. Through their experiments, Jae-Heung Ko and colleagues find that “Upregulation of an Arabidopsis *RING-H2* gene, *XERICO*, confers drought tolerance through increased abscisic acid biosynthesis.” Their findings appear in the latest issue of The Plant Journal.

The team over-expressed the *XERICO* gene in *Arabidopsis* plants, and analyzed the overall expression of genes in both transgenic and wild-type plants at various growth stages. The researchers found that adult transgenic plants were more

resistant to salt and osmotic stress compared to wild-type controls, however young seedlings showed hypersensitivity to the same stresses, as well as to exogenous abscisic acid (ABA). ABA functions in plant development and stress responses, such as drought. The team reports that the level of various plant hormones was altered in transgenic plants over-expressing XERICO. Understanding how ABA is regulated, and how its accumulation affects the level and performance of other plant hormones, is crucial in developing drought tolerant crops.

Subscribers to the Plant Journal can read the complete article through <http://dx.doi.org/10.1111/j.1365-313X.2006.02782.x> or <http://www.blackwell-synergy.com/doi/full/10.1111/j.1365-313X.2006.02782.x>. Other readers can access the abstract through <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1365-313X.2006.02782.x>.

ANNOUNCEMENTS

COURSE ON CROP PRE-BREEDING SCHEDULED

The Brazilian Agricultural Research Corporation (EMBRAPA), the Cooperative Program on Agricultural Research, Development and Innovation for the South American Tropics, and the Food and Agriculture Organization of the United Nations (FAO) will hold an International Course on Crop Pre-breeding in Brasilia, Brazil, on October 17-27, 2006. The objective of this course is to train Latin-American researchers in strategies of use of vegetable germplasm, with emphasis on pre-breeding. For more information, visit http://www.cenargen.embrapa.br/pre-melhoramento/lng/index_ing.html.

ACCESS TO LEARNING AWARDS OPEN FOR NOMINATIONS

The Bill & Melinda Gates Foundation's annual Access to Learning Award 2007 is open for nominations. The award recognizes excellence in providing access to information by utilizing new information and communication technologies in an innovative way, at no cost to the user. The recipient will receive an award of up to US \$1 million. Deadline for nominations is December 31, 2006. A PDF version of the application is available at <http://www.inasp.info/ldp/awards>.

BIOINDUSTRIES TO GATHER IN BIOBRASIL 2006

The industry hub of Belo Horizonte, Minas Gerais, Brazil will play host to BioBrasil 2006: Business and Trends in Biotechnology, on October 17-18 of this year. Created by FIEMG System - Industry Federation of Minas Gerais State – the conference focus on subjects as agribusiness, human and animal health, and will include the 3rd International Congress of Biotechnology, Exposition of Products and Services in Biotechnology, and AI-INVEST Business Meeting. For more information, visit <http://www.fiemg.org.br/Default.aspx?tabid=1888>.

MALAYSIA CONFERENCE TO EXAMINE BIODIESEL

Biodiesel: Renewable Energy will be held at the Ritz Carlton, Kuala Lumpur Malaysia on August 22-23, 2006. This premier regional conference will explore the business opportunities the biodiesel industry has to offer; from production to marketing to distribution. Read more at http://www.coreventus.com/brochures/Biodiesel_KLC31B.pdf.

DOCUMENT REMINDERS

FIELD TESTING WORKSHOP PROCEEDINGS RELEASED

The proceedings of a workshop on “Criteria for Field Testing of Plants with Engineered Regulatory, Metabolic, and Signaling Pathways” has been released. Sponsored by the Information Systems for Biotechnology, the workshop promoted a multidisciplinary discussion about field testing and management of plants that contain the "newer," more complex genes emerging from plant genomics projects. Download the proceedings at http://www.isb.vt.edu/proceedings02/the_proceedings02.pdf

FSANZ INVITES COMMENT ON GM ALFALFA APPLICATION

Food Standards Australia New Zealand (FSANZ) invites public comment on an application from Monsanto Australia to approve food derived from genetically modified (GM) herbicide-tolerant alfalfa. FSANZ has concluded that food derived from the crop is as safe and as wholesome as food derived from other alfalfa varieties, but nevertheless welcomes public comment from industry, public health professionals, government agencies, and consumers. Details of all the

assessments above can be found at <http://www.foodstandards.gov.au/standardsdevelopment/documentsforpublicco868.cfm>. Submissions close on September 20, 2006.

DRAFT REPORT ON AFRICA BIOTECH AVAILABLE

Freedom to Innovate: Biotechnology in Africa's Development is the draft report of the recently concluded meeting between the High-Level African Panel on Modern Biotechnology of the African Union (AU) and the New Partnership for Africa's Development (NEPAD). Download the complete report at http://www.nepadst.org/doclibrary/pdfs/abp_july2006.pdf.

RISK ASSESSMENT BOOK PUBLISHED

"Environmental Risk Assessment of Genetically Modified Organisms, Volume 2: A Case Study of Bt Cotton in Brazil" focuses on transgenic cotton in Brazil and addresses both environmental and agricultural impacts. It draws out some general risk assessment guidelines and demonstrates the need for case-by-case analysis. Order the book at <http://www.cabi-publishing.org/bookshop/BookDisplay.asp?SubjectArea=&Subject=&PID=1892>

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