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).

## In This Issue

**June 1, 2007**



**Biofuels Supplement (25 May 2007 Issue) [Read latest news]**

<< Previous Issue | [ Print PDF | Archive | Translations | Subscribe | RSS ]

# News

## GLOBAL

[Top]

### ON GM CROPS AND BEES

In the spring of 2007, a novel kind of bee colony die-off was reported in the US. The phenomenon, termed "colony collapse disorder CCD", could result in loses of up to 90% in some bee hives. In several European countries, like Germany and Switzerland, similar observations were made. Scientists have researched possible causes of the decimation of bee populations, and analyzed whether the use of genetically modified (GM) plants could be a factor. A study conducted at the University of Jena from 2001 to 2004 that examined the effects of pollen from GM Bt maize on bees found no evidence of a "toxic effect of Bt corn on healthy honeybee populations".

"So far, no evidence for direct or indirect damages to bees by currently approved GM crops has been reported in the scientific literature. This is the result of numerous experiments in the laboratory or the field, in some of which the

exposure towards GM crops or their products possible under natural conditions has been strongly exaggerated" writes Professor Klaus-Dieter Jany.

Recently, a local court presiding over a case filed by two beekeepers and eight agricultural organizations against a GM maize farmer in France ruled in favor of the farmer.

For more information, contact n.moll@europabio.org.

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[Top]

## BIOTECH INVENTIONS AND PATENT REGIME

Exclusivity rights implicitly granted by patents are a hindrance to knowledge diffusion and enhancement, yet no practical suggestion on how to overcome the problem has been made. This issue is very much of a concern in the context of biotechnology, where greater flexibility is needed. T.V.S. Ramamohan Rao of the Indian Institute of Technology proposes a practical approach by which a slightly more extensive knowledge disclosure from patent applicants is required.

Rao suggests that an innovator at the final product stage can recover costs when a marketable final product is available. This will require a modification of the patent regime since the early stage innovators will be under obligation to provide the knowledge on a non-exclusionary basis. This accelerates knowledge diffusion, says Rao, while preserving the appropriateness of intermediate discoveries of knowledge. Hence, eventual benefits among discoveries of knowledge can be given payments proportional to the costs incurred in each stage of research and development.

Read the full article in the Asian Biotechnology and Development Review or email T.V.S. Ramamohan Rao at rmrao@iitk.ac.in.

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[Top]

## MISSING LINK IN PLANT VIT C PATHWAY DISCOVERED

Vitamin C (ascorbate) is an essential human nutrient, with important metabolic and antioxidant functions. Humans rely on dietary intake of vitamin C, mainly from fruits and vegetables, as our body is unable to synthesize this compound. Vitamin C deficiency is however a problem mainly in developing countries, especially Africa and southern Asia, where fresh fruits and vegetables are not always available, and access to vitamin supplements is limited.

A main pathway for the production of ascorbate in plants is the L-galactose pathway, and until recently, all the enzymes in this pathway except one had been identified. A team of scientists from New Zealand has now added the last piece to the puzzle, isolating a gene coding for the missing enzyme, an L-galactose guanyltransferase. The team also showed that over-expression of this gene results in a 3-fold increase in ascorbate in transgenic tobacco, indicating that the gene is likely to be the rate-limiting step for vitamin C production. This gene could therefore be used to manipulate crop plants for elevated vitamin C accumulation.

The open access article is published in this week's issue of the Proceedings of the National Academy of Sciences (PNAS), and can be viewed at http://www.pnas.org/cgi/reprint/104/22/9534

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[Top]

### NEXT-GENERATION GM CROPS SOON TO ENTER MARKET

A new breed of transgenic crops will soon make their debut. Researchers at the University of Nebraska at Lincoln have inserted a gene for herbicide resistance from a bacterium into plants, creating new crops which could help combat the spread of resistance to other commonly used herbicides such as glyphosate. The plants are resistant to a compound called dicamba, which kills broadleaf weeds but spares grasses, and has been used for decades to protect fields planted with corn, a member of the grass family.

Monsanto, the maker of the 'Roundup Ready' line of glyphosate-resistant crops, has already licensed the dicamba technology. The company says it hopes to make dicamba-resistant soybeans available commercially in three to seven years, with cotton to follow after that.

Read the news article at http://www.nature.com/news/2007/070521/full/070521-10.html.

## AFRICA

[Top]

### IITA AND PARTNERS TO WORK IN GATSBY CROP-LIVESTOCK PROJECT

The International Institute for Tropical Agriculture (IITA) and its partners, the Institut de la Recherches Agronomiques du Niger (INRAN), the American Peace Corps, and several NGOs and farmer groups, will be working under the Gatsby improved crop–livestock project in Niger Republic. The project provides on-farm demonstrations of improved cereal–legume cropping systems, and dry season livestock feeding trials for manure generation. About 400 farmers are expected to participate in 2007, up from 160 in 2006.

The news article is available at http://www.iita.org/cms/details/news_details.aspx?articleid=1043&zoneid=81

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[Top]

### 2006-2007: WORST ANNUAL HARVEST EVER FOR SWAZILAND

The lowest annual harvest in Swaziland was recorded for the year 2006/07 as a result of a prolonged dry spell and high temperatures that ravaged the country. Around 400,000 people will need approximately 40,000 tons of food assistance to meet the needs from now until the next harvest in April 2008, according to the report by the United Nations Food and Agriculture Organization (FAO) and the World Food Programme (WFP).

Maize production in 2006/07 is nearly 60 percent below last year's level, while prices of major cereals have increased considerably in response to local shortages and as a result of significant maize price increases in South Africa, the main exporter to Swaziland. The FAO/WFP assessment recommends a targeted approach for food aid, and timely provision of agricultural inputs, including seeds, fertilizers, credit facilities and access to tractors, to support the hungry African nation until the next cropping season.

Readers can access the complete news article at http://www.fao.org/newsroom/en/news/2007/1000563/index.html.

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[Top]

### BIOTECHNOLOGY AND INVESTMENT IN AGRICULTURE IN THE ARAB WORLD

The Arab Authority for Agricultural Investment and Development, in collaboration with Islamic Development Bank, and the Jordanian Center for the Agricultural Research and Technology Transfer, organized the third conference on "Biotechnology Applications in Agricultural Investment in the Arab Countries". The event was held in Amman, Jordan on May 22-24, 2007 to discuss possibilities to increase investments in agriculture and biotechnology in the Arab world. Presentations focused on the importance of biotechnology applications in the agricultural sector, particularly in developing plant varieties that harbor unique traits to resist the environmental and biological stress in the region.

The conference was attended by multi-sectoral participants from 17 countries. For more details contact Prof. Taymour Nasr El-Din, director of AGERI, at taymourn@ageri.sci.eg, or Ismail AbdelHamid at ismail@egypt-bic.com.

## AMERICAS

[Top]

### ACGF SURVEY: LOW SEGREGATION OF GM FROM NON-GM CORN

A survey released by the American Corn Growers Foundation (ACGF) reveals that only 26% of 1,057 grain elevators report that they require the segregation of genetically modified organisms (GMO) varieties from non-GMO varieties. This is cause for concern since it undermines the corn gluten export market that is important for the future of the ethanol sector says Dan McGuire of ACGF.

The survey, done in April 2007 in 18 states that produce U.S. grain, also notes that 31% of elevators offered a premium for non-GMO corn varieties although a very minimal number gave discounts for GMO corn varieties.

See the survey highlights at http://www.acgf.org/programs/survey-results/2007/Default.htm or view the article at http://www.acgf.org/.

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[Top]

### BENEFITS OF GLYPHOSATE-RESISTANT CROPS

Glyphosate has become a buzz word in agriculture nowadays. The herbicide was first manufactured by Monsanto and was claimed to be the world's biggest-selling herbicide by the manufacturer. Glyphosate-resistant crops have also been developed following the success of glyphosate in the market, but many governments remain cautious about allowing the use of herbicide-resistant crops for fear that genes that confer herbicide resistance could spread far beyond agricultural fields.
Despite such concerns, many agricultural researchers now say glyphosate-resistant (GR) crops have had widespread environmental benefits, at least compared with the previously used alternatives. "Glyphosate-resistant crop weed management systems are generally safer to the environment than what they replace, and in many cases much safer," says Stephen Duke, a plant physiologist at the U.S. Department of Agriculture's Agricultural Research Service.

Perhaps one of the biggest benefits of GR crops is their indirect impact on topsoil. GR crops require no-till agriculture, which saves the topsoil, and ultimately saves farmers time and money. Additional impacts could come as farmers switch to herbicides that are more toxic to mammals. Researchers at the University of Illinois, Urbana-Champaign found that switching from GR crops to conventional seeds with other herbicides would require farmers to increase the pesticide doses applied to the average U.S. farm by about 10% per hectare in soybeans and 25% per hectare in cotton, which would be harmful to insects and other mammals.

Read the news article at http://www.sciencemag.org/cgi/content/full/sci;316/5828/1116.

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[Top]

### NEW USDA RESEARCH FACILITY OPENS IN HAWAII

The United States Department of Agriculture recently opened a modern scientific facility in Hawaii where pioneering research on the island's exotic tropical crops will be conducted. The multi-million-dollar office and laboratory structure is part of the U.S. Pacific Basin Agricultural Research Center, operated by USDA's Agricultural Research Service (ARS).

ARS researchers have long been developing new and environmentally friendly ways for Hawaii's growers and home gardeners to raise premium tropical and subtropical crops-from bananas to papayas. ARS Administrator Edward B. Knipling said, "Our research has helped reduce the need for pesticides, open new markets for Hawaii-grown fresh produce, and unlock secrets about genes that hold the key to boosting plants' ability to survive drought or resist attack by disease."

Read the press release at http://www.ars.usda.gov/News/docs.htm?docid=1261.

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[Top]

### HOWARD G. BUFFETT FOUNDATION FUNDS RESEARCH ON SWEET POTATO FOR AFRICA

The Howard G. Buffett Foundation recently granted $3 million to the Donald Danforth Plant Science Center to fund research to enhance resistance to virus infection and to increase the nutritional content of sweet potato for Africa. The Danforth Center has engaged in the project the International Potato Center (CIP) in Lima, Peru, and the National Agricultural Research Organisation of Uganda (NARO), to create a multi-institutional collaboration.

Sweet potato production is decimated by dual infections of sweet potato feathery mottle virus (SPFMV) and sweet potato chlorotic stunt virus (SPCSV). Danforth Center scientists will work to increase resistance to these two viruses, while undertaking research that will increase the amount of vitamins, folate, zinc and iron.

The news article can be read at http://www.danforthcenter.org/newsmedia/NewsDetail.asp?nid=128.

## ASIA AND THE PACIFIC

[Top]

### CRITICAL ISSUES ON PLANT BIOSECURITY FOR INDIA

Upgrade quarantine facilities, strengthen risk analysis mechanisms, and develop pest database, standard operating procedures, and research prioritization – these are critical issues that India has to address to ensure biosecurity. This was forwarded by R. K. Khetarpal and Kavita Gupta in "Plant bisecurity in India- Status and strategy" published in the Asian Biotechnology and Development Review. Biosecurity encompasses the policy and regulatory framework to analyze and manage risks in the sectors of plant life and health, and related environmental concerns.

The authors from the National Bureau of Plant Genetic Resources in New Delhi add that there is a need for India to

develop a national biosecurity policy and a strategy for "effective convergence of related activities of all stakeholder departments and ministries." They present a scenario for a comprehensive strategy using a holistic approach to ensure biosecurity that "seeks to use the synergies of various existing sectors without necessarily creating new structures."

Read the article in the Asian Biotechnology and Development Review, Vol. 9, No. 2 issue or email R.K. Khetarpal at rkk94rk@yahoo.com.

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[Top]

## VIETNAM TO SET UP MICROBIOLOGY AND BIOTECH INSTITUTE

Vietnamese Prime Minister Nguyen Tan Dung has approved Decision No 661/QD-TTg, dated May 24, 2007, to establish the Institute of Microbiology and Biotechnology by upgrading the existing Biotechnology Center. The institute, under the Hanoi National University, will conduct scientific research, train human resources and give consultation on microorganisms and biotechnology.

In a related development, Can Tho City in the Mekong Delta (a southern province of Vietnam) will invest this year VND352 billion (US$22 million) in projects to develop local high-tech industries from now to 2020. Initial projects will include work on growing more high-value crops, adapting advanced technologies in the preservation and processing of farm products, building biology laboratories and applying information technology in administration management.

For further information, contact Hien Le of Biotech Vietnam at hientttm@yahoo.com.

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[Top]

## VIETNAM DEVELOPS PESTICIDES FROM TREE SEEDS

The Vietnam Pesticide Company (VIPESCO) has successfully developed pesticides from the seeds of the Neem tree, originally from India. The pesticides, 1500 EC and 5000 EC, can kill various kinds of worms, fungi and pests which harm rice and other crops. They are reported not to be harmful to the environment.

VIPESCO said that the two pesticides are especially suitable for integrated pest management. To ensure sufficient supplies for production, the company plans to import Neem seeds from several countries in the region.

For further information, contact Hien Le of Biotech Vietnam at hientttm@yahoo.com.

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[Top]

## JASMINE RICE AROMATIC GENE DISCOVERY

KDML 105, a well known traditional Thai jasmine rice variety, is sweet aromatic rice. Although rice aroma combines more than 200 volatile compounds, a compound named 2-acetyl-1-pyrroline (2AP) is the main constituent. The aromatic 2AP has also been found in other cereals, pandan, bread flower, fungi and bacteria. A group of Thai scientists at the Rice Gene Discovery Rice Science Center, Kasetsart University, Thailand has identified the DNA sequences that enhance the synthesis of 2-acetyl-1-pyrroline in plants and fungi. A patent application has been

placed at the US Patent Office.

More information available at: http://dna.kps.ku.ac.th/rice/ and http://www.freepatentsonline.com/20060168679.html

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[Top]

## PREMIER OF VICTORIA OPEN TO BIOTECHNOLOGY

Steve Bracks, Premier of Victoria, Australia is open-minded when it comes to biotechnology. He recently announced that an "independent panel" will decide whether the ban on genetically modified (GM) canola will be lifted or not. Although there are still oppositions to lifting the ban, Bracks believes that times have changed since the ban was implemented in 2004.

On the other hand, GM critic Bob Phelps said that the panel was in favor of biotechnology but they were not experts on trade or marketing issues. He wants the ban to be extended until 2013. The Victorian government will announce its decision after the panel submits its reports in September.

The news article is available at http://www.theage.com.au/news/national/bracks-open-minded-about-genetic-engineering/2007/05/26/1179601737374.html.

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[Top]

## CSIRO AND AGRESEARCH COLLABORATE ON BIOTECH

Australia's CSIRO Plant Industry and AgResearch, New Zealand's crown research institute, have agreed to work together on plant-based research with the possibility of commercializing the outcomes of research and development activities. Both organizations will jointly identify and undertake projects in farming and crop research, and in plant biotechnology. In addition, they will collaborate on research and development workshops, technical exchange programs, and conferences.

See http://www.agresearch.co.nz/anm2Net/templates/agrnews.aspx?articleid=546&zoneid=3 for additional information.

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[Top]

## NEW ZEALAND APPROVES GM BRASSICA FIELD TESTS

The Environmental Risk Management Authority (ERMA) has approved the experimental planting of genetically modified (GM) brassica vegetables such as broccoli, cabbage, cauliflower and kale over a period of ten years in test sites located in Lincoln, New Zealand. The application for field tests was filed by the New Zealand Institute for Crop and Food Research. These GM vegetables are resistant to caterpillar pests with genes derived from the bacterium *Bacillus thuringensis*. The tests sites are to be monitored to ensure that there will be no seed strike.

The full news is available at http://www.ermanz.govt.nz/news-events/archives/media-releases/2007/mr-20070528.html.

# EUROPE

[Top]

## SWITZERLAND FUNDS BIOTECH RESEARCH

The Swiss National Science Foundation will fund a four-year SFr12 million (US$9.8 million) program to do work on genetically modified (GM) plants. A total of 27 projects will be implemented to look into the uses and risks of releasing GM plants in the country. In addition to biological experiments, research will also involve economic, legal and ethical aspects.

Eights projects will look into plant resistance and various environmental risks by carrying out three proposed field experiments with transgenic wheat. These requests to carry out field experiments are pending.
In November 2005, Swiss voters accepted a proposal for a five-year blanket ban on GM organisms in Swiss agriculture. This resulted in some of the toughest legislation on GM organisms in Europe. Eventually, the government allowed the Science Foundation to proceed with research that would provide science-based information regarding the release of GM plants in Switzerland.

Online information is available at http://www.swissinfo.org/eng/front/detail/GM_projects_take_seed.html?siteSect=105&sid=7875352&cKey=1180535884000

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[Top]

## DRAFT DECREE ON CO-EXISTENCE GETS APPROVAL FROM FLEMISH GOV'T

The Flemish government has approved a draft decree to regulate the co-existence of genetically modified (GM) crops with conventional and organic crops. The draft regulation on co-existence is focused on communication and information, and does not yet contain details such as the size of separation distances.
A farmer with the intention of growing a GM crop must notify his colleagues. Neighbors growing similar non-GM crops within the separation distance may object to his intention. In the case of an objection, the authorities will determine whether there are options that allow cultivation of the GM crop without risk of economic damages to conventional farmers.

Read the news article at http://www.coextra.eu/country_reports/news857.html.

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[Top]

## BT LEVELS VARIATIONS ARE WITHIN A BIOLOGICALLY EXPLAINABLE RANGE

Greenpeace recently presented in public the results of its study on the Bt concentration in insect-resistant maize. A total of 600 leaf samples from several fields of MON810 Bt maize in Germany and Spain were tested by a Swiss laboratory, Ecostrat, for Bt levels. The results of the tests showed that the Bt concentrations varied considerably and were not the same in every plant.

Johannes Jehle of the Dienstleistungszentrum ländlicher Raum (DLR) and colleagues, however, are not able to corroborate the results of the Greenpeace study. Jehle led a three-year research project in which Bt levels in

genetically modified MON810 maize were measured. The researchers were able to demonstrate that Bt expression varies depending on the plant organ under investigation, the stage of development, the location and the weather. Over a period of three years with extreme weather differences, they measured variations that were 3 to 10 times smaller overall than those in the one-year Greenpeace measurements. The researchers concluded that the variations in Bt levels were within a natural, biologically explainable range.

To read more, visit http://www.gmo-safety.eu/en/news/568.docu.html.

## Research

[Top]

### CONSERVATION AND SUSTAINABLE USE OF CROP WILD RELATIVES

Crop wild relatives (CWR) are plants that are more or less closely related to a crop, but have not been domesticated. CWRs are likely to be the progenitors or direct ancestors of crops. The conservation of CWRs has been considered very important for crop improvement because these plants contain many important and useful traits, such as resistance to abiotic and biotic stresses.

Several activities aimed in conserving CWRs are being conducted through national and international initiatives. However, there are also numerous constraints in implementing conservation programs for CWRs. These are reviewed in the paper published by the group of Vernon Heywood in the journal Agriculture, Ecosystems and Environment.

Heywood and colleagues presented that among the issues that needs to be addressed in CWR conservation include the need for information systems, the incorporation of the conservation of CWRs into existing plant genetic resources programs, the assessment of the effectiveness of conservation actions, and policy development and legal framework.

For the complete paper, please visit http://dx.doi.org/10.1016/j.agee.2006.12.014.

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[Top]

### IMPROVEMENT OF PROTEIN QUALITY IN TRANSGENIC SOYBEAN PLANTS

Glycinin is one of the major storage proteins in soybean seeds. Increasing the amount of glycinin, which is rich in sulfur-containing amino acids, has been the target of several research activities in order to obtain amino acid balance in soy protein. Soybean is an important component of livestock and poultry rations.

A transgenic approach for increasing glycinin in soybeans was presented by the group of H.A. El-Shemy and colleagues in Japan and Sudan. The researchers introduced a modified glycinin gene into soybean embryos via particle bombardment. The construct include a hygromycin phosphotransferase gene (*hpt)* as a selectable gene, and green fluorescent protein (*sGFP*) as a reporter gene.

El-Shemy's group reported that the expression of *sGFP* was detected in about 50 % of the putative transgenic soybeans. They also observed that most of the transgenic plants developed normally and produced seeds. The group also observed that the seeds from the transgenic plants have higher levels of glycinin compared with non-transgenic plants.

The paper, published by Biologia Plantarum, can be accessed by subscribers at http://www.springerlink.com/content/q050781662816g86/.

[Top]

### TURKISH FRUIT GROWERS' PERCEPTIONS ON PESTICIDE HARM NOT REFLECTED ON THEIR PRACTICES

A study conducted by researchers at Ege University and Canakkale Onsekiz Mart University in Turkey concluded that fruit producers in the country do not usually translate their level of awareness on the effects of pesticides into their practices.

The researchers analyzed responses from 3% of fruit growers in the Kemalpasa county in Turkey. The region is where fruit orchards and vineyards are found. The researchers determined that pesticide practices were influenced more by certain grower characteristics such as age, fruit-growing experience and education.

Among those interviewed who do not see pesticides as harmful, there are more producers that use the recommended dose and type of pesticide. However, majority of farmers still use more than the recommended amount of pesticide, or used pesticides which were not appropriate for the fruits trees. This shows that they are still not sufficiently informed on these subjects and there is a need to increase the knowledge of farmers, said the researchers.

The paper published by Crop Protection, is accessible at http://dx.doi.org/10.1016/j.cropro.2006.08.006.

[Top]

### DEVELOPMENT OF GM PEARS WITH INCREASED SHELF LIFE

Transgenic pears were developed by researchers in Japan and the United States with the goal of improving the shelf life by reducing ethylene production. The researchers obtained the transgenic plants through *Agrobacterium*-mediated transformation system using leaf discs, the first time the technique is used in pears.

The researchers transformed the pear cultivar 'La France' and have determined that transgenics plants have an 85% reduction in ethylene production in *in vitro* shoots. The *in vitro* selection method allowed them to select the most promising lines at the early stages without waiting for the pears to bear fruits.

The reduction in ethylene production is believed to be a good indicator that the fruits will have an increased shelf life. An antisense cDNA that encode an ACC oxidase (ACO) gene was used during transformation.

The complete paper, published in Plant Science, can be accessed by subscribers at http://dx.doi.org/10.1016/j.plantsci.2007.03.014.

## Announcements

[Top]

### 6TH ASIAN CROP SCIENCE ASSOCIATION CONFERENCE

The BioAsia 2007 conference will be held on November 7-9, 2007 in Bangkok, Thailand, with the theme "Technology for self-sufficient agriculture in Asia". The event aims to bring together agricultural scientists in Asia to share research experiences. The focus of the conference is to address science and community aspects that assure the long-term survival of local, healthy, secure, sustainable food and energy in Asia. Topics for discussion include biofuels,

phytobioremediation, biopharming, and cassava biotechnology.

For more information, visit http://www.biotec.or.th/BioAsia2007/home/conference.asp

[Top]

## Document Reminders

### PK ON MOLECULAR PHARMING OUT

Pocket K 26: Molecular Pharming and Biopharmaceuticals is now available on the web at http://www.isaaa.org/kc/inforesources/publications/pocketk/default.html#Pocket_K_No._26.htm. This Pocket K presents general information on biopharming, and potential benefits and challenges of biopharmaceuticals for developing countries. Pocket Ks are Pockets of Knowledge, packages of information on crop biotechnology products and related issues. They are produced by the Global Knowledge Center on Crop Biotechnology (KC) of the International Service for the Acquisition of Agri-biotech Applications (ISAAA).