CROP AND WEED SCIENCE NEWS

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2008

Plants - Source of Proteins

GM Tomato Producing Functional Human Antitrypsin

GM plants hold a promising alternative for production of pharmaceutical proteins. Compared to other systems, the use of GM plants offers advantages like the feasibility of low-cost and large-scale production and reduced risk of contamination with human pathogens. A wide array of plant-derived pharmaceutical proteins has been developed to treat diseases such as lymphoma, and cystic fibrosis.

Scientists from the Indian National Botanical Research Institute have developed transgenic tomato lines producing a functional human alpha-1-antitrypsin (AAT) protein. AAT is the most common serine protease inhibitor in the human plasma. Deficiency in AAT results to diseases like liver cancer, pulmonary emphysema, arthritis and dermatitis. Previous efforts to source AAT from transgenic bacteria, yeast cells and animals proved to be unsuccessful. The AAT derived from these hosts were either unstable, biologically inactive or mixed with immunogenic impurities.

The transgenes have been found to be stably expressed in successive generations. AAT from the GM tomato lines have exhibited high specific activity. On the average, 195 milligram of AAT can be obtained per kilogram of tomato leaves. The abstract of the article published by the journal Transgenic Research is available at http : // www. Springerlink.com / content / 053336v077647j05/?p=afd6add86e7f4e06ad327a2c504f690a&pi=2

Lupins as Protein for Animal Feed

To increase the availability of proteins and to reduce the cost of proteins for animal feed, lupins may be used as concentrate. However, there is problem with leaves dropping off the plants as harvest approaches. It is therefore important to assess correct harvest time to encounter only minimum leaf loss, especially as leaves have a high protein concentration.

New Genes Identified

Gene that Controls Fruit Shape

Scientists from the Ohio State University have identified a gene in tomato that can control fruit elongation, a discovery that could help plant breeders develop fruits of unusual shapes and sizes. Square cucumbers and round bananas might not really be so far off.

The gene, dubbed SUN, is only the second ever found to play a significant role in the elongated shape of various tomato varieties. A unique characteristic of the gene is that it affects fruit shape after pollination and fertilization. When SUN was

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Materials intended for publication in the Newsletter may please be submitted to the Editor - **Prof. A. P. Patra** or Asstt. Editors - **Prof. K. Sengupta**, Dept. of Agronomy, **Prof. P. K. Chakraborty**, Dept. of Agril. Meteorology., BCKV, Mohanpur, Nadia, West Bengal, India

Editor's Column

Open Journal System (OJS) is a journal management and publishing system that was developed by the Public Knowledge Project (PKP) to expand and improve access to research and the quality of refereed research. This open access initiative seeks to improve the scholarly and public quality of journal publishing. OJS is open-source software freely available to journals worldwide, which can speed up information delivery to end-users, and improve the indexing and search capacities of the journal. The International Rice Research Notes (IRRN) is going to open access using the OJS, and in future there will be no more printed copies of the publication.

SRI Rice (cv. *Khandagiri*)

— *Prof. R. K. Ghosh & Mr. Anadi Bhanja*

Resistant Plants

Glyphosate-Resistant Johnson Grass

A group of scientists from the University of Arkansas and a separate group from the Missisipi State University have confirmed cases of Johnson grass resistance to glyphosate in their respective states. Investigations with the Monsanto researchers were conducted during the past few months in greenhouse conditions which will be followed by an extensive field study this season.

Dr. Jennifer Ralston, U.S. chemistry technical lead for Monsanto, has called for a quick action to control the problem. She has said that they are working with these university experts to provide growers with the best management practices. To maintain the efficacy of the herbicide and value of the technology, they recommend growers to scout fields and utilize additional modes of action that complement the *Roundup Ready* system to control problem weeds while reducing the likelihood of developing performance issues".

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Calendar of Events

- Fifth International Weed Science Congress in Vancouver to be held on June 21-27, 2008 Registration for the Congress is made on-line at http://iws.ucdavis.edu/5intlweedcong.htm or http://www.wssa.net/; Contact : Albert J. Fischer, IWSS Secretary-Treasurer, ajfischer@ucdavis.edu, website: http://iws.ucdavis.edu/
- International Conference of NGOs (Non-Governmental Organizations) to be held in London, United Kingdom, on 10th July to 20th July 2008; Contact - Richarddolls Foundation" <rdfoundation33@bigmir.net>
- International Conference on Grain Legumes : Quality Improvement, Value Addition and Trade (ICGL 2009) will be held on February 14-16, 2009 at Indian Institute of Pulses Research (IIPR), Kanpur (UP), India. The abstract can be submitted online at abstract- icgl 2009 @ rediffmail.com. Last dates for submission of abstract and full paper are 30 Sept. and 30 Nov., 2008, respectively. For details visit the website http://www.iipr.res.in
- International Seminar on Weed Science to be held at Jabalpur tentantively on February, 2009. Contact Director, NRCWS, ICAR, e-mail: nrcws@sancharnet.in, website: www.nrcws.org

News

New Invasive Weed

Invasive weed- *Oryza rufipogon* has been identified by Prof. R.K.Ghosh and Mr. K. Barui in the locality (Reported in Asian Pacific Weed Science Society Newsletter Vol.1. Issue 1 2008 and in Asian Age etc).

Bidhan Chandra Krishi Viswavidyalaya has been identified as one of the ten centres of India with National Importance for the National Invasive Weed Surveillance Programme, NRCWS, ICAR under Ministry of Agriculture, Government of India, of Weed Science during March, 2008. (PI- Prof. R.K.Ghosh, Agronomy)

An International Symposium on Agrometeorology and Food Security was held on February, 18-21, 2008, at the Central Research Institute for Dryland Agriculture (CRIDA, Hyderabad). Prof. P. K. Chakraborty and Associates of the Department of Agril. Meteorology and Physics, Bidhan Chandra Krishi Viswavidyalaya presented their papers in this symposium, which received the "Best Poster" Award in the Poster Section.

Rice Today : The **only international magazine** dedicated to rice related research for development. It is informative, illuminating and enjoyable. One can enjoy a sampler of 'Rice Today' by downloading the free software.

Conferring Degrees

Sixteenth Convocation of Bidhan Chandra Krishi Viswavidyalaya

Sixteenth Convocation of Bidhan Chandra Krishi Viswavidyalaya was held on April 10, 2008. Hon'ble Chancellor Sri Gopal Krishna Gandhi, Governor of West Bengal presided over the Convocation. Dr. M. V. Rao, President, Agri-Biotech Foundation, Hyderabad, Former Special Secretary, DARE, Govt. of India, Former Special Director General, ICAR and Former Vice-Chancellor of ANGRAU, A.P. graced the occasion as a Chief Guest.

The Viswavidyalaya awarded Ph.D. degree in Agriculture, Horticulture and Ag. Engineering to 51, 8 and 1 students, M.Sc.(Ag.) and M.Sc.(Hort.) degrees to 127 and 21 students, B.Sc. (Ag.) Hons, B.Sc.(Hort.) Hons. And B.Tech (Ag. Engineering) Hons. Degrees to 90, 17 and 13 students, respectively. Sixteen University Gold Medals wee awarded to the students for M.Sc.(Ag.), M.Sc.(Hort.), B.Sc.(Ag.) Hons., B.Sc.(Hort.) Hons. And B.Tech (Ag. Engineering) Hons. Examinations. Seven Gold Medals were awarded to the students for M.Sc.(Ag.), B.Sc.(Ag.) Hons. And B.Tech (Ag. Engineering) Hons. Examinations. Sixteen Merit Certificates were awarded to the students for M.Sc.(Ag.), M.Sc.(Hort.), B.Sc.(Ag.) Hons., B.Sc.(Hort.) Hons and B.Tech (Ag. Engineering) Hons. Examinations. Two Book Prizes were awarded to the students for M.Sc.(Ag.) and B.Sc.(Hort.) Examinations.

New look

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Members selected as Fellow of different Societies and Organizations

Prof. K. Sengupta, Department of Agronomy, BCKV Fellow of Indian Society of Pulses Research and Development 1998.

Prof. R. C.Samui, Department of Agronomy, BCKV Fellow of Indian Society of Oilseeds Research 2006

Prof. S. S. Mondal, Department of Agronomy, BCKV Fellow of Indian Society of Agronomy- 2004-05 (declared in 2007)

Prof. S. Maiti, Department of Agronomy, BCKV Fellow of Indian grassland and Range Management - 2007

Prof. R. K.Ghosh, Department of Agronomy, BCKV Fellow of Indian Society of Weed Science 2008

Prof. R. K. Ghosh, receiving the Award

New Genes Identified (Continued from Page 1)

introduced, via transgene insertion, to wild round fruit-bearing tomato lines, they ended up bearing extremely elongated fruits.

The discovery of the gene may also contribute new insights to the mechanisms of plant development. Esther Van der Knaap, who led the study hypothesized that SUN regulates levels of the amino acid tryptophan in plants. Van der Knaap also postulated that SUN is involved in shape variation through plant hormone and secondary metabolite regulation. Scientists are conducting further studies to find out if SUN, or a closely related gene, is responsible in determining fruit shape in other vegetables and crops.

The abstract of the article published by the journal Science is available at http : // www. sciencemag. org / cgi / content / abstract/319/5869/1527 Read the press release at http://researchnews.osu.edu/archive/tomshape.htm

Gene that controls rice yield

Scientists of the Huazhong Agril. University in China have identified a single Gene (Ghd7) that appears to determine yield, plant height and flowering time. The gene can double the rice yield. They also found 5 different versions of Ghd7, and the most highly active versions were present in warmer regions allowing rice plants to fully exploit sunlight and temperature by delaying flowering and increasing yield. They also found that rice varieties that were shorter in height, had fewer grains per panicle and flowered earlier were lacking in the gene GhD7.

Resistant Plants (Continued from Page 1)

Indonesia Develops a Biotech Drought Tolerant Rice

Rice (*Oryza sativa*), one of the most important food crops, is drastically affected by drought, especially at the reproductive stage, thus, immensely affecting yield. Dissecting the important genes and the genomic regions influencing drought tolerance and yield will aid the breeders in understanding the genetic mechanisms underlying the plants' response to drought. This will then be the basis of the breeding strategies for the development of high yielding and drought tolerant varieties. The Research Centre of Biotechnology, Indonesian Institute of Sciences (LIPI) has successfully developed a genetically engineered rainfed lowland rice cultivar with drought tolerance. Prof. Dr. Umar A. Jenie, Head of LIPI has said that they have created the cultivar by overexpression of the genes encoding the transcription factors OsHOX . Furthermore, the cultivar is now being tested and is already in the early stage of a confined trial in a green house facility. This will be followed by environment and food safety testings as well as a multilocation field testing.

LIPI has also developed a yellow stem borer {*S. incertulas* (Walk)}-resistant rice variety. According to Prof. Jenie, the preliminary field testing result showed that the transgenic crops are not adversely affecting the environment ecology since there is no geneflow to another crop as well as to other insects or soil microbes. He also emphasized that all transgenic rice developed in Indonesia will be tested for its environmental and food safety. For more information visit http://www.biotek.lipi.go.id/index.php/dewisuryani @ biotrop .org.

Recent Approaches in Developing Insect 'Proof' Plants

One of the major successes of plant biotechnology is the introduction of insect-resistance to important crops. Bt cotton and maize have been widely used in global agriculture and have led to significant reductions in pesticide usage. Not all pests, however, are efficiently targeted by the Bt toxins used at present. There is still a need to develop solutions for problems like Bt toxin resistance. A new review paper published by the journal Plant Physiology looks at the recent development to the basic Bt strategy and alternative methods to develop insect "proof" plants.

Plants expressing novel *Bt* toxins like Vip and Cry3Bb1 have been shown to be effective against lepidopteran larvae. Bt genes have also been expressed in the chloroplast genome, resulting to higher levels of toxin accumulation. Scientists are currently exploiting plant-defense proteins like lectins and alpha-amylase inhibitors to combat Bt resistant pests.

Arabidopsis Resistant to Zinc and Cadmium

Plants have the potential to remove toxic heavy metals from the environment (phytoremediation) or extract useful metals from the soil (phytomining). For these applications to be realized however, it will be necessary to elucidate the genetic basis of metal hyperaccumulation in plant cells. Scientists from the University of Heidelberg and Max Planck Institute in Germany found out that expression of a gene that encodes for a metal transporter (*HMA4*) confers heavy metal tolerance to *Arabidopsis halleri*.

A. halleri, a sister species of the model plant *A. thaliana* that can thrive on extreme non-habitable conditions is a powerful model for research on adaptation. The plant accumulates and tolerates leaf concentration as high as 2.2% zinc and 0.3% cadmium in dry biomass. Using RNA interference, the researchers were able to show that zinc hyper accumulation and cadmium tolerance depend on *HMA4* expression. The researchers found three copies of *HMA4* in the genome. Transfer of the gene to *A. thaliana* resulted to plants with increased zinc tolerance.

The full article is available at http : // www. Nature. Com / nature/journal/vaop/ncurrent/full/nature06877.html

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Fighting the Parasitic Weed *Striga*

Striga (*S. hermonthica*), is a plant parasitic weed that causes more than 40 percent loss in the annual cowpea yield in sub-Saharan Africa. Also known as witchweed, it infests some 50 million hectares of cereal crops, specifically maize, sorghum and millet. Now the International Institute of Tropical Agriculture (IITA) and its partners from University of McGill (Canada) and University of Hohenheim (Germany) have found a way to control the weed through a biocontrol agent.

The method utilizes a strain of the fungus *Fusarium oxysporum* that originated from Ghana and Nigeria. Mixture of fungal spores and gum Arabic can be used to coat crop seeds. The fungus remains viable for long periods, making the seeds amenable to storage. The method is cheaper, easier to apply and more effective compared to other techniques such as application of post-emergence herbicides.

The article is available at http : // www. Iita. Org / cms / details/news_details.aspx?articleid=1567&zoneid=81

Biogeochemical Fate of Uranium

Depleted uranium are abundant in the warring areas of Iraq and the Balkans. This metal, which is composed of 97.25% uranium and .75% titanium although less radioactive has the same chemotoxicity as a natural uranium and poses a threat to human population. Uranium can form stable water-soluble complexes and could bind with organic substances to form new substances. This suggest that living organisms could play an important role in geochemical transformations and cycling.

One of the more abundant microorganisms that can conduct mineral transformation is the fungi. An example is the mycorrhiza which forms mutualistic symbiotic association with plant to perform mineral transformation. A study published in the recent issue of Cell Biology reports that the fungi can also play a role in the biogeochemical degradation of depleted uranium. A particular species of mycorrhiza can colonize surfaces of the depleted uranium and transform it into uranyl phosphate minerals.

The abstract of the .article can be accessed at: http://www.sciencedirect.com/science?_

Production of Bio-fuel by Enzyme

A bacteria isolated from Chesapeake Bay may revolutionize the production of biofuels from plant products and left-over brewer's mash, paper trash and some other cellulosic materials. University of Maryland researchers headed by Steve Hutcheson and Ron Weiner developed the technology and started an incubator company called **Zymetis** for the production of the enzyme which they isolated from the bacteria *S. degradans*.

"The new Zymetis technology is a win for the State of Maryland, for the University and for the environment," said University of Maryland President C.D. Mote, Jr. "It makes affordable ethanol production a reality and makes it from waste materials, which benefits everyone and supports the green-friendly goal of carbon-neutrality." The Zymetis process when fully operational can lead the production of 75 billion gallons a year of carbon-neutral ethanol. For further details, see press release at: http://www.newsdesk.umd.edu/scitech/release

Resistant Plants (Continued from Page 2)

GM Strawberries Tolerant to Salt Stress

A group of researchers from India successfully developed transgenic strawberry lines tolerant to salt stress. The lines have been modified to express the gene coding for the protein osmotin. Osmotin is induced by salt, water and low temperature stresses and has also been shown to possess anti-fungal activity. Scientists hypothesized that osmotin provides osmotolerance either by facilitating the compartmentalization of solutes or by being involved in the metabolic alterations during osmotic adjustment.

Genetic limitations, such as strawberry's polyploid nature and its high heterozygosity, complicate breeding efforts. Strawberry is an octaploid, meaning that it has eight sets of homologous chromosomes.

The transgenic lines were found to be stable in successive generations. Compared to their non-GM counterparts, the transgenic lines were found to contain enhanced levels of proline (amino acid involved in osmotic stress response), chlorophyll and total soluble proteins. The growth pattern of the GM lines showed no abnormality, except that their growth rate is slower than other plants.

The article published by the journal Plant Science is available at http://www.sciencedirect.com/science?_

New Canola Line for better health

Canola oil, which is mostly used in the North America, contains high level of essential polyunsaturated fatty acids which the body needs. Hydrogenation of these fats leads to the creation of trans fatty acids that are linked to cardiovascular disease. To reduce this risk M/S Bayer Crop Science has developed a new hybrid Canola line 'InVigor Health'. This canola oil has a high oleic content designed to maintain stability in high heat food processing applications. This character eliminates the need for hydrogenation and avoids the creation of trans fatty acid.

Source : Research, Bayer Scientific Magazine, Edition 19, October 2007

Disease Resistant Rice

Bayer Launches Disease Resistant Rice

Bayer Crop Science has announced the launch of Arize Dhani, a bacterial leaf blight (BLB) disease-resistant hybrid rice variety in India. Bayer claims that, in addition to providing broad protection against BLB, the new rice hybrid can increase yield by 20 to 30 percent compared to ordinary varieties. The company now markets seven rice varieties in India.

Bacterial blight, caused by *Xanthomonas oryzae*, is one of the most common diseases affecting rice worldwide. *Xanthomonas* strains in tropical areas are more virulent than that of in temperate regions. In India, BLB affects 6-7 million hectares annually causing an estimated yield reduction of up to 60 percent. The country is the second largest rice producer after China, growing more than 128 million tons of the staple.

The press release is available at http : // www. bayercropscience. com / bayer / cropscience / cscms. Nsf / id / 20080514_ EN ? open &ccm=400

For membership of the Society please contact Secretary, Crop and Weed Science Society, Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India.