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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NEWS

ETHIOPIA HOUSE TACKLES BREEDERS' RIGHTS, GENETIC RESOURCES

Two bills, providing for Plant Breeders' Rights and Genetic Resources and Community Knowledge and Rights, were endorsed by Ethiopia's House of Peoples' Representatives in a recent regular session.

A report, presented by the Rural Development and the Natural Resources and Environmental Protection Standing committees of the House, indicated that the proclamation providing for Plant Breeders' Rights would enable the private sector to play its role in releasing new plant varieties suitable for various ecosystems in the country.

Members of the Standing Committees also said the proclamation would encourage farmers to use their genetic resources. Moreover, the proclamation would encourage investment and pave the way for the utilization of new plant varieties released abroad.

The Committees also reported that the bill providing for Genetic Resources and Community Knowledge and Rights would have significant importance in the protection of the country's genetic resources, as well as the equitable distribution of the benefits of the resources.

For the full story, visit http://www.ena.gov.et/default.asp?CatId=6&NewsId=191992. You may also write to Margaret Karembu of the Kenya Biotechnology Information Center at mkarembu@isaaa.org.

STRATEGIC ENVIRONMENT ASSESSMENT FOR GM CROPS

A Strategic Environment Assessment (SEA) methodology can be used to ensure that environmental considerations are evaluated in the research and priority-setting process involved in genetically modified (GM) crop research. This entails the systematic accounting of environmental issues when deciding on plans, programs, and research priorities to justify investments in specific biotechnologies. The SEA methodology is expounded by Nicholas Linacre and colleagues in “Strategic Environmental Assessment: Assessing the Environmental Impact of Biotechnology”, published by the International Food Policy Research Institute (IFPRI).

Linacre and colleagues note that “if informed decisions about the value of GMOs are to be made, it will be crucial to have integrated SEAs using qualitative and quantitative assessments that take into account gene flow, toxicity, decision analysis, and uncertainty estimation.” This process will lead to more transparent and defensible decision making in international agricultural research, the authors add.

Details of the SEA are available online at http://www.ifpri.org/pubs/ib/ib41.pdf.

NEW CGIAR RESEARCH PRIORITIES

Participants of the Consultative Group on International Agricultural Research (CGIAR) Annual General Meeting in Marrakech approved new approaches where agricultural research, technology, and food policy initiatives can stimulate economic growth in the Central, West Africa, and North Africa region. They also supported a new CGIAR research agenda aimed at improving the lives of people in the developing countries through sustainable agriculture.

The new agenda include five research priority areas:

• Sustaining biodiversity for current and future generations

• Producing more and better food at lower cost through genetic improvements

• Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products

• Promoting poverty alleviation and sustainable management of water, land, and forest resources, and

• Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger

Additional details of the CGIAR meeting can be viewed online at http://www.cgiar.org/monthlystory/january2006.html

CIMMYT TURNS WHEAT GENOME BACK

Today's bread wheat is the product of a 30,000 year old series of hybridization events. First, wild wheat mated with a species of goat grass, and their offspring – a primitive wheat called emmer – crossed with another wild goat grass 21,000 years later to produce the modern day *Triticum aestivum*. This wheat has been so popular, it, and its descendants have been the only kinds of wheat planted for centuries.

This wide planting of the crop has led to low genetic diversity in wheat. To counter this, researchers at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico have turned back the clock to bring wheat to its original form.

CIMMYT researchers collected wild goat grass from the Middle East, crossed it with modern emmer, and created different varieties of bread wheat all over again. The new wheats, however, are still not suitable for farming, but the experiments

have hitherto been promising: one strain produces 20-40% more grain under dry conditions, as compared with conventional varieties.

Read the complete article at http://www.nature.com/news/2006/060102/full/060102-2.html. For more information on wheat's gene pool, as well as other research activities of the institute, visit CIMMYT at http://www.cimmyt.org.

NABDA DG LAUDS AGRI-BIOTECH

In a keynote address at a public awareness workshop on "Biotechnology for Human Development," Professor Bamidele Solomon, director general of the National Biotechnology Development Agency (NABDA), said it was imperative for Nigeria and other countries in sub-Saharan Africa to tap into the knowledge of biotechnology because "no aspects of our lives is un-affected by [the technology]."

Earlier in a welcome address, Professor Israel Adu, Vice Chancellor of the University of Agriculture, Abeokuta (UNAAB), said it was in the interest of Nigerian farmers to embrace bio-engineered cassava and cowpeas to improve their productivity. Professor Adu urged Nigerian scientists to intensify efforts on the genetic improvement of indigenous crops with desirable traits, adding that "we should not sit and wait for those who do not eat cassava to modify it for us to contain vitamins, protein, and iron."

The workshop was organized by the International Institute of Tropical Agriculture (IITA), in collaboration with NABDA, UNAAB, the Nigeria Agriculture Biotechnology Development Project (NABP), and the United States Agency for International Development (USAID). Over 350 persons participated, most of them civil servants or members of the academe.

For more information, contact Taye Babaleye, head of IITA's Public Affairs, at t.babaleye@cgiar.org. Visit the IITA at http://www.iita.org.

NIGERIA WORKS ON BIOTECH KNOWLEDGE SHARING

To demystify the term "biotechnology," the Nigeria Agriculture and Biotechnology Project (NABP) was established a few years ago to lay the foundation for a sustainable biotechnology program in Nigeria. It aims to assist the Government of Nigeria in building institutional and scientific capacity to conduct research, implement priority regulatory guidelines and policies to create an environment for

biotechnology development, and increase public awareness of the benefits of biotechnology.

The project has three components: (a) Improved research and development of crops and livestock, (b) improved implementation of biosafety guidelines and field testing of bio-engineered crops, and (c) Improved public acceptance of biotechnology.

One main component of NABP's research work is cowpea improvement. Nigeria is the world's leading producer of cowpea, but the more than 2.5 million metric tons produced annually does not meet the demand for local consumption. Cowpea is a highly nutritive crop with over 22% protein in the grain, an ideal crop to check malnutrition among children in rural Nigeria. With biotechnology, cowpea production will be improved without the need for excessive use of insecticides to protect the plants when growing in the field or in storage after harvest.

For more information on NABP, contact Taye Babaleye, head of IITA's Public Affairs, at t.babaleye@cgiar.org. Visit the IITA at http://www.iita.org.

RESEARCH

TWO ENZYMES FOUND TO KEEP OFF PESTS

Constantly beset by pests, subjected to harsh soils, and buffeted by unfriendly weather, higher plants have evolved defense mechanisms to protect themselves against stress. One such immune response involves the plant hormone jasmonic acid (JA), which controls the expression of target genes, which, in turn, are produced during tissue damage. It is thought that these target genes play a direct role in destroying insect pests.

Hui Chen, of the Department of Energy Plant Research Laboratory, and colleagues test this hypothesis in "Jasmonate-inducible plant enzymes degrade essential amino acids in the herbivore midgut," an article that appears in the December 27, 2005 issue of the Proceedings of the National Academy of Sciences.

Through tests on the gut *Manduca sexta* larvae fed on tomato plants, researchers found that two JA-induced proteins, arginine and threonine deaminase, act in larval midgut to break down amino acids and thus affect insect performance. Moreover, transgenic plants over-expressing arginase were found

to be more resistant to *M. sexta* larvae, and this effect was correlated with reduced levels of midgut arginine.

Read the complete article at http://www.pnas.org/cgi/content/full/102/52/19237.

GENE SHOWS PROMISE FOR SALINE AGRI

The Dead Sea is one of the most saline lakes on earth, is about ten times saltier than most oceans, and may well be the breeding place of the most salt-tolerant microorganisms in the world. To adapt to such salt stress, microorganisms synthesize low molecular mass compounds, such as glycerol, to balance the high external osmotic pressure.

Eurotium herbariorum, a common fungal species, was isolated from the lake, and it is this species that figures in a research article from the December 27, 2005 issue of the Proceedings of the National Academy of Sciences. Yan Jin and colleagues from the University of Haifa, Israel find that "A MAPK gene from Dead Sea fungus confers stress tolerance to lithium salt and freezing–thawing: Prospects for saline agriculture."

Researchers isolated and sequenced the EhHOG gene from the fungus. The gene, which codes for a protein that allows cells to produce more glycerol, was found to be highly similar to genes from *Aspergillus nidulans*, *Saccharomyces cerevisiae*, and *Schizosaccharomyces pombe*. When expressed in yeasts made susceptible to high salt conditions, the gene allowed the yeasts to survive even under saline stress.

Researchers found a similar gene in peas (*Pisum sativum*) which could be used to render plants resistant to salt stress. They, moreover, state that "The Dead Sea is potentially an excellent model for studies of evolution under extreme environments and is an important gene pool for future agricultural genetic engineering prospects."

Read the complete article at http://www.pnas.org/cgi/content/full/102/52/18992.

WITH NOD, SOYBEAN FOUND RESISTANT TO MILDEW

Soybean is a highly important crop, and protecting it from pathogens and stress is a priority for many agricultural scientists. In a step toward adding to the crop's defenses, Haifa M. Duzan and colleagues of McGill University find that "Nod factor induces soybean resistance to powdery mildew." Their work appears in Plant Physiology and Biochemistry.

Microsymbionts, or microorganisms which live on plants, secrete molecules which aid in initiating the symbiosis between host and parasite. Nod factors are one such molecule. In this research, scientists treated soybean plants with Nod Bj-V, and found that the plants were rendered resistant to powdery mildew. They also found that at 10?6 M (moles of Nod factor per liter) of Nod factor applied, soybean plants continued to be resistant to the disease even two weeks after inoculation.

Subscribers to Plant Physiology and Biochemistry may read the complete article at http://dx.doi.org/10.1016/j.plaphy.2005.08.004

ANNOUNCEMENTS

WEBCAST AND MEDIA TELECON ON BIOTECH CROPS

An international launch of the International Service for the Acquisition of Agri-biotech Applications (ISAAA) 2005 Annual Review on the global status of commercialized biotech/genetically modified crops in 2005 is set for January 11, 2006 at 10.00 to 11.30 hrs. Eastern Standard Time (EST). The global perspective on the reach and influence of biotechnology will be discussed by a panel led by Dr. Clive James, ISAAA's chairman and founder, via webcast and teleconference. Executive summaries of the Annual Review and press releases in English and several other languages will be made available online at http://www.isaaa.org/kc immediately after the international launch.

USDA ACCEPTS TASC APPLICATIONS

The U.S. Department of Agriculture's Foreign Agricultural Service today announced that it is accepting applications for fiscal year 2006 assistance under the Technical Assistance for Specialty Crops (TASC) Program. Proposals can be submitted by one of two deadlines – Feb. 1, 2006 and July 1, 2006, 5:00 p.m. Eastern Time. The program is designed to open, retain, and expand markets for U.S. specialty crops. Eligible crops include all cultivated plants and their products produced in the United States except wheat, feed grains, oilseeds, cotton, rice, peanuts, sugar, and tobacco. Applicants may submit an application through http://www.fas.usda.gov/cooperators.html. For more information, visit http://www.fas.usda.gov/mos/tasc/tasc.asp.

CIMMYT TO HOLD WORKSHOP

The International Maize and Wheat Improvement Center will convene an "International Workshop on Increasing Wheat Yield Potential," with emphasis on the developing world. Presentations will cover the latest technologies in breeding, genetics, physiology, and crop management that can be applied to maximize genetic yield potential and its expression. Participants will include wheat scientists, and representatives from the largest and highest yielding production zones in the world. The workshop is set for the 20th-24th of March, 2006, in Obregon, Mexico. For more information, visit http://www.cimmyt.org.

CBT NEWS FEATURE

Sweet Leaves, Human Flesh: Agricultural Practices of the Tupi-Guarani Tribe

They who first lived in the rainforests and plains of Brazil kept no record of their passing. There were no temples, monuments, or holy scrolls. The acidic soil and humid climate of the region destroyed what little there was left, including wood and bones.

What we do know about the first settlers in the area can be inferred from their pottery, or the weapons they left behind. There are also the chronicles of the first Europeans who landed on the shores of the region, which tell of copper-skinned natives who sweetened their brews with the addition of mere leaves; who consumed their human prey and made sport of their enemies.

The tribes' beginnings, however, are not as gloomy, nor as sensational. Brazil was actually home to hundreds of different tribes, which could roughly be divided into two groups. The Marginal or Semi-Marginal peoples depended on hunting, gathering, and small-scale agriculture. The Tropical Forest peoples, inhabitants of the rainforests, relied heavily on agriculture and fishing to supply their needs.

One such Tropical Forest tribe was the Tupi-Guarani, a major ethnic family whose territories spanned Central Brazil and Paraguay sometime in the first millennium AD. Their lands stretched from the Amazon to the Rio de la Plata, and from the foothills of the Andes to the Atlantic Ocean.

The Tupi-Guarani were rootcrop growers, hunters, gatherers, and warriors. They had no religious institutions, no social classes, no power structure, or system of taxes. Unlike most sedentary agricultural societies, they were scattered widely

across their lands; but like progressive societies, they were often at war with each other.

The Tupi-Guarani dressed little, wore next to nothing, but adorned their skin with dyes and feathers. Their warriors were virtually hairless, but were painted in stripes corresponding to each enemy they had killed.

Life in a Tupi-Guarani village was simple. Tribesmembers were united by common ancestors, although they rarely had a chieftain to rule them. They shared huts, where they slept in cotton hammocks, and lounged in separate rooms. One hut would house would typically be 250-300 feet long, 30-50 feet wide, and would house as many as 30 families.

As rainforest soil was not especially favorable to the cultivation of food crops, the Tupi-Guarani practiced slash-and-burn agriculture. They would clear sections of rainforest away by hacking tree trunks and slowly burning away at the base of the trees. Since the Tupi-Guarani had no domesticated animals to help them out with their tasks, all their work was done manually; and since rainforest soil was not rich in nutrients, the early farmers planted two to three crops together, and, upon harvest, abandoned their field.

Although a short-term solution to what should have been a great problem for the security and stability of the tribe, slash-and-burn agriculture surprisingly did not destroy the Amazonian rainforest. If anything, it taught the Tupi-Guarani the concept of taking only what they could, and no more. Fore instance, maize was used sparingly, and only to produce fermented beverages. Manioc, or cassava, an important rootcrop, was not instantly harvested, and was left in the ground until it was immediately needed.

Men cleared out forested areas for planting, a task which would keep them busy for about two months. The planting, weeding, and harvesting were the work of the women. Thus, for at least ten months out of every year, men were free to hunt, gather, go to war, or simply while the days away – something which conquerors would later take to mean idleness, a trait they rather incorrectly ascribed to generations of natives.

The Tupi-Guarani planted cassava, yams, cotton, gourds, tobacco, maize, pepper, beans, squash, pineapple, and sweet potato. They imported maize from other tribes west of the Andes. They fermented maize and cassava to produce an alcoholic beverage called cauim. They also planted a sweet herb called kaa he-he, known today as the stevia shrub. Natives used stevia to enhance the taste of bitter mate or their medicinal potions – long before the conquerors brought the plant to Europe; centuries before food manufacturers used the herb, and its sweet component stevioside, to produce today's sweeteners, such as saccharin and aspartame.

War was especially important to the Tupi-Guarani, although they were not keen on amassing lands and territories. Enemies were as trophies to them – enemies were also food. Prisoners of war would be kept for several months, treated well, given a wife, and, in a sense, fattened for the feast. At the end of an appointed time, he would be killed and laid out, roasted, for the village and its guests to partake of. Old women would drink his blood; mothers would smear his blood upon their breasts; the unfortunate wife, though mourning over him, would still eat his flesh. Only the executioner would be in hiding, away from the feasting, to protect himself from the victim's – meal's – ghost.

It was this aspect of Tupi-Guarani culture that frightened Europeans the most. One such account was penned by a German mercenary named Hans Staden, who spent three years amongst the Tupi-Guarani. They reportedly tied his legs together and forced him to hop through the huts, taunting him all the while with, "Here comes our food hopping toward us!"

The accounts of the conquerors, though exciting, generalized the state of the Tupi-Guarani. Only a few tribes practiced cannibalism; outside of the immediate conquered, only a few other tribes engaged in such brutal warfare.

What did last after the conquest, however, was the Tupi-Guarani language. For some time, after the first landing in the year 1500, Tupi, along with Portuguese, became the general language of the colony. The Tupi-Guarani were also the focus of Jesuit missionaries, who learned to speak the tribal language, and who used it to preach Christianity to several different tribes. The Portuguese conquerors also carried back some words to Europe, including abacaxi (pineapple), mandioca (cassava flour), caju (cashew), tatu (armadillo), and the piranha.

There were once five million of the Tupi-Guarani tribe scattered throughout the rainforests and mountains. Today, there are only two hundred thousand left behind. Their legacy – their words, crops, sweets, even bizarre, otherworldly tales of their rites and rituals – lives on.

For more information on the Tupi-Guarani, visit
http://www.primitivism.com/society-state.htm,
http://www.datamex.com.py/guarani/en/marandeko/brief_history.html, and
http://www.instituto-camoes.pt/revista/revista8in.htm.

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