CROP BIOTECH 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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In This Issue:

NEWS

STUDY SHOWS WORLDWIDE ADOPTION OF CIMMYT VARIETIES

"Impacts of international wheat breeding research in the developing world, 1988-2002" reported that the extensive use of germplasm by public and private breeding programs from the Mexico-based International Maize and Wheat Improvement Center (CIMMYT), combined with the widespread adoption of CIMMYT-derived varieties has generated enormous benefits. Estimates showed

that benefits associated with the use of CIMMYT-derived germplasm range from US$ 0.5 to 1.5 billion.

The report, authored by M.A. Lantican, H.J. Dubin, and M.L. Morris, updates the findings of two earlier studies and extends the coverage to include many countries in Eastern Europe and the former Soviet Union. It noted that while CIMMYT invests only about US$ 9-11 million (in 2002) each year in wheat improvement research, "the returns to investment in international wheat breeding research in general and in CIMMYT's wheat breeding program in particular are clearly huge."

View the full report at http://www.cimmyt.org/english/wps/publs/catalogdb/index.cfm.

DEFRA RELEASES GENE TRANSFER STUDY

The United Kingdom's Department for Environment, Food, and Rural Affairs (DEFRA) has released "The Potential For Dispersal Of Herbicide Tolerance Genes From Genetically-Modified, Herbicide-Tolerant Oilseed Rape Crops To Wild Relatives," a study authored by Roger Daniels and colleagues. In the study, researchers assessed the transfer of herbicide tolerance both in the field and in the laboratory, on a total of 95,459 seedlings of wild relatives of GMHT rape.

Plants were tested by application of a small quantity of glufosinate ammonium to individual leaves, and observing whether any necrosis resulted. Seed collected from plants growing in or near oilseed rape fields were germinated and the resulting seedlings were sprayed with the same herbicide to assess tolerance. Any plants showing signs of tolerance to the herbicide were subjected to PCR to identify whether the gene was present.

A single plant of *Sinapis arvensis* showed no reaction to the application, and a leaf of this plant was taken for PCR analysis. Researchers found that the gene construct was present in the leaf sample. Two plants of *Brassica rapa* also showed resistance to herbicide treatment.

Since only one or two plants showed resistance to treatment, researchers stated that they did not see the transfer of herbicide tolerance to wild relatives as a major problem, and that the risks of such a phenomenon were "minimal." They also estimated the incidence to be very low, since no other examples of resistance to herbicide treatment were found in other samples in the study, or in other samples in studies conducted elsewhere (e.g. in France, where over 2 million seeds of wild relatives were tested). Nevertheless, the report stresses the need for further study in order to completely and adequately assess any potential risk of gene transfer.

Download the complete report at http://www.defra.gov.uk/environment/gm/research/pdf/epg_1-5-151.pdf

AMMANET DISCUSSES USE OF MAS TO IMPROVE CROPS

The African Molecular Marker Applications Network (AMMANET) members recently met in Nairobi to strategize on how to use DNA Molecular Marker technology to improve crops in Africa.

Issues of crop pests, diseases and yields were discussed, with the participants agreeing that MAS [Marker Assisted Selection] could be applied efficiently and cost-effectively to solve some of the problems. They identified bananas, beans, cassava, cowpeas, maize, millet, rice and sorghum as some of the priority crops to concentrate their activities on. Smaller groups were formed to work on each crop.

Dr Richard Edema (redema@agric.mak.ac.ug) the newly elected coordinator of the group and a Molecular Plant Virologist in the Department of Crop Science, Makerere University, Uganda, told *Crop Biotech Update* that AMMANET's main goal is to share resources, synergies, and exchange information on crop improvement initiatives on the continent. "This is the only way to eliminate duplication of efforts that has led to huge waste of resources on the continent," he emphasized.

AMMANET, which is currently funded by the Rockefeller Foundation, has over 100 members from seventeen countries in Africa, including Kenya, Uganda, Tanzania, Malawi, Egypt, Zambia, Zimbabwe, Nigeria, South Africa, Sudan, Mozambique, and Rwanda among others. Dr. Jedidah W. Danson (j.danson@cgiar.org) a member of AMMANET secretariat and a Molecular Biologist with CIMMYT's African Livelihoods Program, said the organization with will work closely with National Agricultural Research Systems (NARS), Regional organizations like Biosciences Eastern and Central Africa (BECA), Association for Strengthening Agricultural Research in Africa (ASARECA), African Agricultural Technology Foundation (AATF), Forum for Agricultural Research in Africa (FARA), the CGIAR centers, and other relevant international bodies to fulfil their objectives.

For more information contact Daniel Otunge (dotunge@absfafrica.org) of KBIC visit AMMANET website: http://www.africancrops.net

INDIAN AGRI MINISTER FAVORS BIOTECH R&D

To meet the government target of doubling food production by the end of the 11th Five Year Plan, it is essential to develop world class biotechnology research facilities in the country and deploy biotechnological advances to Indian agriculture. This was stated by Shri Sharad Pawar, Union Minister of Agriculture, Consumer Affairs, Food, and Public Distribution, while chairing the 76th Annual General Meeting of the ICAR [Indian Council for Agricultural Research] Society.

Shri Pawar said that the overall strategy regarding the agricultural sector needs to be designed to harness the potential of cutting edge science, while building on the primary production base. The biotech-based hybrid technology has a high potential to increase productivity, resistance to biotic and abiotic stresses, and quality in a number of field and horticultural crops, animals, and fish. It could also impart resilience to production in fragile ecosystems and meet the natural and man-made challenges of feeding a burgeoning population.

For more information, visit http://www.icar.org.in/pr/15072005.htm and http://www.icar.org.in/agmshpr05.htm. You may also contact Bhagirath Choudhary at b.choudhary@cgiar.org

EU COMMISSION RELEASES BIOTECH PATENT REPORT

The EU Commission has published its second report on the EU Biotechnology Patents Directive. The report deals with "Developments and implications of patent law in the field of biotechnology and genetic engineering." Among others, it specifically investigates the issues of patenting of human DNA and human stem cells. The Commission recommended continued monitoring of developments, and considered it premature to make a definite position.

A total of 27 States and one international patent organization have implemented the Directive, while four EU Member States and Switzerland/Liechtenstein are still in the process of doing so. EuropaBio, the European association for bioindustries, noted its disappointment with the Commission on the lack of a firmer stand on the deviating implementation of the Directive among the states.

EuropaBio also stressed that an EU Commission report revealed that the growth rate of R & D intensity (R&D expenditure as a % of GDP) has been declining in Europe since 2000 and is now close to zero.

See the full article in http://www.europabio.org or email Adeline Farrelly of EuropaBio at a.farrelly@europabio.org. The EU Commission report on Directive 98/44/EC is available at http://www.europa.eu.int/comm/internal_market/fr/indprop/invent/index.htm

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RESEARCH

CGIAR NOTES RESEARCH IMPACTS ON AFRICA

The Consultative Group on International Agricultural Research (CGIAR) said that for over three decades, it has assisted Africa with the help of partner agencies to provide new crop and farming technologies that benefit poor farmers, create wealth, and protect the environment. Some of these technologies include:

- New Rices for Africa (NERICAs) developed by The Africa Rice Center that provide higher yields, are drought tolerant and thrive in salty soils
- New, improved, drought-resistant maize varieties adapted for harsh ecologies of southern Africa
- Quality protein maize**,** containing twice the amount of beneficial nutrients such as lysine and tryptophan
- Vitamin A for Africa (VITAA) Partnership to help tackle Vitamin A deficiency (VAD) through new, orange-fleshed sweet potato varieties with enhanced beta-carotene
- Improved sorghum, millet, groundnut, chickpea and pigeonpea varieties

See details of these technologies in http://www.cgiar.org/newsroom/releases/news_20050311.html

PAPER SHOWS PLANTS DIFFER IN RESPONSE TO INSECT ATTACK

The Max Planck Institute for Chemical Ecology's Dominik Schmidt, along with colleagues, report that "Attack from the Same Lepidopteran Herbivore Results in Species-Specific Transcriptional Responses in Two Solanaceous Host Plants." Their findings are published in July's Plant Physiology.

Plant hormones, in particular jasmonic acid, ethylene, and salicylic acid, are excreted when plants respond to wounding and attack by insects. This is a general response, but according to the research, different plants will react differently to attack by a single insect. Using a potato microarray with over 10,000 potato cDNAs (representing approximately a third of the potato genome), researchers compared which genes are expressed or regulated when the plants *Nicotiana attenuata* and *Solanum nigrum* are attacked by the insect *Manduca sexta*.

Researchers found that *S. nigrum* responded less to herbivory by *M. sexta*. This may be attributed to *N. attenuata*'s longer evolutionary association with *M. sexta*, researchers said, which may have allowed N. attenuata to evolve a stronger

response to attack. *S. nigrum*, on the other hand, may not have evolved to respond to *M. sexta* just yet, even as it has the ability to respond to other insects, such as flea beetles.

Read more in this month's Plant Physiology at http://www.plantphysiol.org. The article appears on pp. 1763-1773 of the journal.

HOST CAN HELP RNA VIRUS EVOLVE, STUDY FINDS

RNA viruses, or viruses with RNA genomes, evolve rapidly, and, due to recombination with their hosts, can contribute to disease outbreaks by rendering vaccines ineffective. RNA recombination may have contributed to recent outbreaks of dengue, SARS, and influenza. The Tombusvirus that infects plants is no stranger to recombination either, and its damaging effect on plants is something scientists have long sought to curtail, or remove altogether.

In "Genome-wide screen identifies host genes affecting viral RNA recombination," Elena Serviene and colleagues of the University of Kentucky use yeast cells and Tombusvirus to show that host genomes can actually spur RNA virus evolution. Their findings are published in the latest issue of the Proceedings of the National Academy of Sciences online.

Using a high-throughput screen of a single-gene deletion library composed of 80% of yeast genes, as well as the tomato bushy stunt virus, researchers found 11 host genes that significantly affected viral recombination. A single deletion of the identified genes had three types of effects: five genes increased viral recombination, four decreased the accumulation of recombinants, and two changed the profile of recombinants. Four of the five genes had a role in RNA degradation, which could suggest that such a phenomenon could play a role in viral RNA recombination. Researchers also found that one of the genes has similarities with those found in rice and Arabidopsis, suggesting that the gene may increase viral recombination in plants as well.

Find out more at http://www.pnas.org/cgi/doi/10.1073/pnas.0504844102

STUDY LOOKS AT DIVERGENCE OF SEED SIZE

Angela T. Moles of the National Center for Ecological Analysis and Synthesis of the United States, and colleagues determine the "Factors that shape seed mass evolution" through statistical analysis of data from present-day species, as well as those available from paleobotanical literature. Their findings appear in the latest issue of the Proceedings of the National Academy of Sciences online.

It was not until 85 million years ago that seed sizes changed dramatically, resulting in seeds greater in size by as much as 11 orders of magnitude compared with their ancestors, or even with their present-day cousins. To determine what factors led to such diversity in seed size, researchers used seed mass data from 12,987 seed plant species, 318 of which were gymnosperms, and 12,669 of which were angiosperms. Using a statistical technique called correlated divergence analysis, and factoring in various aspects of plant growth, including growth form, temperature, precipitation, and leaf area index, among others, they found that difference in seed mass have arisen mainly due to evolutionary divergence in growth form.

Researchers also found that species with unassisted dispersal or wind dispersal had smaller seeds than species dispersed by animals or water. They also confirmed that herbs and grasses generally make smaller seeds than shrubs, which generally make smaller seeds than trees or vines.

For more information, download the article at http://www.pnas.org/cgi/doi/10.1073/pnas.0501473102.

PEAR PROTEIN CHARACTERIZED IN STUDY

In “Isolation, Characterization, and Cloning of a-L-Arabinofuranosidase Expressed during Fruit Ripening of Japanese Pear,” Akira Tateishi and colleagues from Nagoya University purify a protein involved in fruit ripening. Their findings are published in the latest issue of Plant Physiology.

The action of enzymes on the cell wall of fruits, mainly by removing side chains from sugars in the cell matrix, contributes to fruit softening, and thus affects fruit shape and quality. In the case of this study’s Japanese pear, the enzyme, a-L-Arabinofuranosidase (a-L-arafase), was extracted and purified from the cell walls, and its gene coding sequencing isolated. Researchers did not detect the enzyme in the fruit’s buds, leaves, roots, or shoots; they also found the same enzyme may be implicated in ripening in other fruits such as peaches, apples, avocados, and persimmons.

Information on the enzyme’s protein sequence also allowed researchers to predict its behavior, or how it folded, and how it was transported out of the cell. Read more in this month’s Plant Physiology at http://www.plantphysiol.org. The article appears on pp. 1653-1664 of the journal.

CBT NEWS FEATURE

One Nation Over the Waters: Agricultural Practices of the Flathead Nation of Native Americans (The Salish, Ktunaxa, and Pend d'Oreille Tribes)

With funds from Congress, the blessing of President Thomas Jefferson, the assistance of 45 men, and the companionship of a dog, Meriwether Lewis and William Clark set off on a journey of discovery across what was then the uncharted territory of the western United States. The passage would take three years, and span lands that would later become 11 states. It was the year 1804, and the wanderlust that had gripped Europe centuries before had still not eased its hold on one of its former colonies.

One year later, in September 1805, Lewis and Clark found themselves in what would later be Montana, amongst mountains, rivers, streams, woods, and plains teeming with game. Greeting them was a party of 400 Native Americans, composed of members of the Salish tribe, later united with the Ktunaxa and Pend d'Oreille into what would be known as the Flathead nation. The name came from the practice of most Indians of the Columbia region, who used to compress their heads by artificial means. Strangely, none of the three tribes of the Flathead nation did have flat heads.

The traditional tribes of the nation were more hunters and gatherers than they were farmers. They hunted buffalo, deer, elk, and other wild game. They gathered plant foods such as bitterroot, camas, moss, wild onions, Indian potatoes, and sarvis berries, all of which were preserved for later use. Those who lived nearer the mountains subsisted on berries, as a powerful enemy, the Blackfeet tribe, cut off passage to the buffalo hunting country. Water was easy to come by; with rivers and streams snaking through the rich land, the tribes could fish, float their boats, and, when settlers came, use it to find precious metals and convert land into farms and cattle country.

In the meantime, with the land still a stranger to mining and industry, the Salish, Ktunaxa, and Pend d'Oreilles hunted, gathered, practiced some forms of agriculture, fought their wars, and worshipped their gods.

The Salish called themselves Sqéliö, or The People. The Salish nation itself is one of many Salish-speaking tribes, but one among the few who did not practice the custom of head flattening, i.e. tying padded boards to their foreheads in early adolescence, so that their heads would be tapered by the time they reached adulthood. As mentioned, they were hunters, fisherfolk, and gatherers more than they were agriculturists. They did, however, keep domestic animals, including one known as the wool dog.

The Salish were, and still are, blanket weavers. Most of their blankets, shawls, or dresses were made using wool from the mountain goat or the wool dog. Wool dogs were so prized that they were kept apart from the other dogs of the tribe and were not allowed to breed outside of their pedigree.

The changing seasons shaped the lives of the Salish and Pend d'Oreille. Spring was the time of the bitterroot harvest, June the time of sweet camas bulbs, and the blooming of the wild rose the signal that buffalo calves had been born and it was time for the hunt. Summer was a time of berry gathering, drying, and storing. Fall was for hunting, where men hunted for large game, and women processed the meat for winter, or used the remaining hides to make clothes and moccasins. Winter involved some hunting, or indoor weapon making. Fishing was a regular activity all throughout the year.

The Ktunaxa (or the Kootenai), on the other hand, had lived in both the United States and Canada for about 3000 years. They were primarily hunters and fisherfolk; indeed, their name means "licks the blood," referring to a traditional hunting custom. Their Creation History describes how the Sun and Moon were brothers who produced the powerful life force for all earthly creations; these brothers, the myths say, transformed all beings who chose to live on earth into physical forms, and henceforth assigned them a domain and complementary tools. This concept of interdependence, and its effect on the delicate balance of the natural world, marks the culture of the Ktunaxa.

Like the Salish and Pend D'Oreille, the Ktunaxa's lives revolved around the seasons. Their diet consisted mainly of salmon, starchy roots, and bulbs. They were semi-nomadic, making winter villages near good fishing sites, and preserving whatever food they could gather. Migration began in early spring, when bitterroots were ripe and fish were many. In early summer, they traveled east to hunt buffalo, then returned to their spring lodgings to process and store the meat. As with the Salish and Pend D'Oreille, they gathered huckleberries, serviceberries, and chokecherries, and preserved them for their winter stores.

The Ktunaxa, however, practiced some form of agriculture other than domesticating animals. For instance, they cultivated a unique species of tobacco for trade with other tribes. Moreover, they practiced aquaculture and fisheries, as they depended upon salmon, sturgeon, suckers, whitefish, and trout in the nearby Kootenay River Basin. Other Ktunaxa who lived far from the basin, on the other hand, practiced little agriculture, and hunted large game.

With Lewis and Clark came curiosity. With curiosity came migration, and with migration came industry. Over the years, many more of the new colonists would meet more of these tribe members, who had long lived in the western Americas, and whose cultures saw life in mere stones, spirits in mountains, and ancestors in the stars. With the coming of industry and progress, most tribes disappeared, or fused into nations, or were gathered into reservations.

In 1855, the Salish, Ktunaxa, and Pend D'Oreille tribes were gathered into the Flathead Reservation, home to the Confederated Salish and Kootenai – here, the Salish and Pend D'Oreille are one tribe, and the Ktunaxa another. They became the first nation to designate a wilderness area, and to this day, believe in their role as stewards of the land and its resources.

Through the centuries of transforming seasons and upheavals, the Salish, Ktunaxa, and Pend D'Orielle, though brought together by the demands of industrialization, still find themselves inextricably linked to their land. "The earth is our historian," one Salish statement says, "It is made of our ancestor's bones. It provides us with nourishment, medicine, and comfort. It is our source of our independence; it is our Mother. We do not dominate Her, but harmonize with Her."
For more information on the Flathead Nation, visit http://www.charkoosta.com.

DOCUMENT REMINDERS

NEW WORLD FRUITS DATABASE

The New World Fruits Database, a compilation of information on the edible fruits and nuts of the Americas, is now available. It lists 1256 species, belonging to 303 genera and 69 families, which are described according to taxonomic and vernacular nomenclature, uses of fruits and their plants, geographic distribution, germplasm availability, and bibliographic references. The database is a collaborative effort among three organizations: the International Plant Genetic Resources Institute (IPGRI), International Center for Tropical Agriculture (CIAT), and Centre de Recherche en Aménagement et Développement (CIRAD). Additional information on this database is available at http://www.ciat.cgiar.org/.

ANNOUNCEMENT

WARDA TO HOLD WORKSHOP

A regional workshop on "Policies and Strategies for Promoting Rice Production and Food Security in Sub-Saharan Africa" will be held at the Africa Rice Center in Cotonou, Benin, Africa from November 2-5, 2005. Additional information on the workshop may be obtained from http://www.warda.org.

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