ABSP II Southeast Asia

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MVR Tomato Project: Looking Forward to 2006

Product developers convene and coordinate workplan

Scientists from the Asian Vegetable Research and Development Center (AVRDC) - The World Vegetable Center, Indonesia, and the Philippines involved in the development of Multiple Virus Resistant (MVR) Tomato gathered to standardize activities and protocols in their respective research stations for 2006.

Activities and workplan for the current year were set by product developers during the 2nd ABSP II Multiple Virus Resistant (MVR) Tomato Coordination and Planning Meeting held last January 10-11, 2006 at the Institute of Plant Breeding - University of the Philippines Los Baños (IPB-UPLB).

Participants in the 2nd ABSP II MVR Tomato Coordination and Planning Meeting. 1st row L-R Dr. Cecilio Arboleda, Dr. Desiree Hautea, Dr. Peter Hanson, Chancellor Luis Rey Velasco, Dr. Virginia Ocampo, and Dr. Enrico Supangco.

The team agreed to come up with a common publication, which will include the sequence information of cucumber mosaic virus (CMV) from Taiwan, the Philippines, and Indonesia. Furthermore, efficient screening protocols for tomato yellow curl virus (TYLCV) and tomato leaf curl virus (TLCV) using *Bemisia tabaci* as vector will be developed. In line with this, the AVRDC screening protocol will be adapted by product developers to suit their conditions. Dr. Peter Hanson, AVRDC tomato breeder, will send the AVRDC scoring system with corresponding pictures to each of the member partners. In the process of refining the procedure, only one isolate will be used in the screening.

Dr. Chien-An Liu, a molecular biologist, presented his work on CP-Mediated ToLCV-TW Resistant Transgenic Tomato Plant Development, while Dr. Peter Hanson discussed the Development of Molecular Markers for TLCV Host Plant Resistance. Both scientists are from the AVRDC-The World Vegetable Center.

The results of the Ex-Ante Impact Assessment of MVR Tomato for both Indonesia and the Philippines were presented, as well as the Public Outreach Communication activities.

Participants visited the MVR tomato project activities and facilities, as well as other related activities at IPB. These included: the different collections of CMV and TLCV from major tomato growing areas in the Philippines, the set-up for screening tomato varieties

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AVRDC transfers MVR technology to the Philippines

The technology of transgenic CMV and non-transgenic Gemini virus resistance, both of which are significant in the development of MVR Tomato, have been formally transferred to the Philippines from the Asian Vegetable Research and development Center (AVRDC)—The World Vegetable Center.

The Material Transfer Agreement (MTA) Signing and Turn-over Ceremony of Tomato Seeds was one of the highlights of the recently concluded 2nd ABSPII MVR Tomato Coordination and Planning Meeting.

Seeds of F3 molecular mapping population for TLCV resistance were turned over by AVRDC to the University of the Philippines Los Baños (UPLB).

Once the biosafety approval is granted by the National Committee for Biosafety of the Philippines,seeds of F1 crosses between CMV-CP mediated resistant lines and local varieties will be given to UPLB.

Dr. Peter Hanson of AVRDC turns over seeds of F3 molecular mapping population for TLCV resistance to UPLB represented by Chancellor Luis Rey Velasco.

Risk comm principles introduced to Indo extensionists

Agricultural extension workers in Indonesia learned the basic principles of risk communication in a two-day workshop held in Hotel Gumilang Sari, Bandung, Indonesia from December 13-14, 2005.

The workshop was attended by 30 agricultural extension workers and researchers from different provincial and district agricultural offices from east, west, and central Java; Yogyakarta, Banten, and Jakarta.

The event was organized by the Indonesian Vegetables Research Institute (IVEGRI), in collaboration with the International Service for the Acquisition of Agri-biotech Applications (ISAAA).

Resource persons, led by Drs. Tantono Subagyo and Inez Slamet-Loedin discussed risk communication through lectures and group exercises. Participants also learned about ABSP II activities and interventions in Indonesia related to biotech crop research and development.

The workshop for agricultural extension workers was the second in a series of risk communication workshops in Indonesia supported by ABSP II, in collaboration with ISAAA. These workshops provide scientists, researchers, extension workers, and media people with the knowledge and skills in communicating biotech issues effectively to different audiences .

Asian journalists oriented on FSBR eggplant technology

Fifteen journalists from leading broadsheets of India, Bangladesh, and the Philippines, together with ABSP II partners from Sathguru, Maharashtra Hybrid Seed Company (MAHYCO), Tamil Nadu Agricultural University (TNAU), and the University of the Philippines Los Baños (UPLB), participated in a 2-day meeting held November 13-14, 2005 at The Residency Hotel and TNAU, Coimbatore, India.

The meeting was part of the communication strategy of the project on fruit and shoot borer (FSBR) eggplant in the three partner countries to properly inform the media on the issues and concerns of Bt technology, specifically in the development of FSBR eggplant.

Major issues raised during the meeting were: 1) the cost of the Bt eggplant seeds, 2) expected period of product release in India, 3) tests to ensure product safety, and 4) benefits that Mahyco will derive from the public-private collaboration.

Journalists witness farmers harvest FSBR eggplant

The Philippine delegation was composed of science and technology news correspondents Joel Paredes (Business Mirror), Carmela Reyes (Philippine Daily Inquirer), and Melody Aguiba (Manila Bulletin). Dr. Josefina O. Narciso also participated in the event as ABSP II partner.

A field visit to the Review Committee for Genetic Modification trial of Mahyco Bt eggplant Hyb 11 in Nathae Goundan Pudthur Village, Coimbatore was conducted to demonstrate the performance of the MAHYCO Bt hybrid eggplant over regular non-Bt variety.

ICABIOGRAD hosts BARI scientists

Two scientists from the Bangladesh Agricultural Research Institute (BARI) were sponsored by the ABSP II to learn the basics of gene transfer technology and develop Rb transgenic potato lines.

Mds. Altaf Hossain and Mamunur Rasheed, Scientific Officers of BARI, conducted genetic transformation of Bangladesh Diamant and Cardinal Potatoes at the Indonesian Center for Agricultural Biotechnology and Genetic Resources Center (ICABIOGRAD) in Indonesia from July 20, 2005 to November 20, 2005.

Plantlets of Diamant and Cardinal Potato were brought from BARI laboratory to ICABIOGRAD, while the *Agrobacterium* with Rb gene construct used was developed by the University of Wisconsin Biotechnology Center.

The activity was part of the ABSP II's effort to incorporate late blight (LB) resistant transgenic potato varieties in Bangladesh using *Agrobacterium*-mediated transformation.

As output, Mds Hossain and Rasheed were able to regenerate plantlets of Diamant and Cardinal to supply the entire transformation activity. Aside from transformation, DNA fingerprinting of non-transgenic Bangladesh potato varieties was done to provide a comparative DNA fingerprint to differentiate transgenic from non-transgenic potatoes.

Initial results indicated generation of transformed Cardinal explants on Kanamycin selective media.

PCR still needs to be performed to confirm the presence of the Rb gene insert. Southern and Northern analysis will also have to be conducted to determine the copy number and transcription levels of the gene insert.

Potato is an important food crop in Bangladesh. While losses due to late blight are estimated at an average of 30%, Rb gene technology can be a cost-effective measure to address the problem of late blight in the country.

Philippine regulatory agencies approve entry of FSBR eggplant

The Bureau of Plant Industry (BPI) of the Philippines has approved the importation of fruit and shoot borer resistant (FSBR) eggplant breeding materials from India.

The permit, issued by the Plant Quarantine Services of BPI, and dated December 20, 2005, allows the importation of F1 crosses, BC1s, and parental lines from Maharashtra Hybrid Seed Company (MAHYCO) of India.

MAHYCO is the donor institution for the development of FSBR eggplant in South and Southeast Asia.

In line with the issuance of the import permit, the National Committee on Biosafety of the Philippines has approved the contained testing of FSBR eggplant in the country.

The FSBR eggplant breeding materials from India include the initial crosses produced during the shuttle research training of Drs. Josefina Narciso and Lourdes Taylo at MAHYCO. Initial crosses had already been made between MAHYCO's Bt donor eggplant and selected Philippine varieties Mara, Mistisa, Dumaguete Long Purple, and Casino. The progeny of these crosses were then backcrossed with their Philippine variety parent at MAHYCO Research Center in Jalna, Maharashtra.

The materials will be used for efficacy testing and generation advance and selection under BL2 greenhouse condition.

The development and commercialization of FSBR eggplant is one of the product development projects of the Agricultural Biotechnology Project II (ABSP II). It hopes to develop an eggplant variety resistant to FSBR in India, Bangladesh, and the Philippines.

The FSBR eggplant technology utilizes the Cry 1Ac gene from the naturally occuring soil bacterium *Bacillus thuringiensis*. When inserted into the plant genome, the gene would allow the plant to produce the Cry 1Ac protein. This protein is toxic to fruit and shoot borers, but is entirely safe for humans.

Transforming Potato for LBR at IVEGRI

Late Blight-Resistant (LBR) Potato materials were transferred to Indonesian Vegetables Research Institute (IVEGRI) from the Indonesian Center for Agricultural Biotechnology and Genetic Resources Research and Development (ICABIOGRAD). These materials will be used for crossing and late blight screening at IVEGRI.

Flower of transgenic Katahdin SP904 kept at ICABIOGRAD.

The potato varieties Granola, Atlantic, and Merbabu were transformed using Agrobacterium with the Rb gene construct, and protocol from the University of Wisconsin. Currently, the Granola and Atlantic cultivars are on selective media. Merbabu explants, on the other hand, showed cell regeneration on the kanamycin media and were transferred to rooting media.

The Granola cultivar was also transformed using protocol developed by Michigan State University. Explants are currently on kanamycin media to select for a positive transformation event.

IVEGRI was also provided with transgenic and non-transgenic Katahdin clones. Polymerase chain reaction (PCR) of transgenic Katahdin SP904 was performed to validate insertion of the gene of interest.

Clones of transgenic and non-transgenic Katahdin, wild potato PT29, Granola, Atlantic, and somatic hybrids are also maintained at the ICABIOGRAD.

Advancing PRSV resistant papaya lines

The PRSV Resistant Papaya product development team is on its way to producing third generation transgenic Davao Solo Papaya.

Self- and sib- pollination of first and second generations of transgenic papaya started last October 2005.

By pollinating the flower of a papaya tree with its own (self-pollination) or with the pollen of its sibling (sib-pollination), homozygous third generation lines are produced.

For a self-pollinating crop like papaya, a homozygous line would provide stable phenotypic expression to succeeding generations. This means that the desirable characters of the parent will be passed on to their progeny.

T2 generation PSRV Papaya at BL2 Facility of IPB-UPLB.

At present, candidate T_1 and T_2 lines are in the reproductive stage. They are maintained at the BL2 greenhouse facility of the University of the Philippines Los Baños-Institute of Plant Breeding (UPLB-IPB).

Candidate lines had been previously subjected to polymerase chain reaction (PCR) analysis, which indicated that the lines contain a copy of the PRSV coat (CP) protein gene.

Analysis is now being pursued to determine the copy number of CP gene in the candidate lines.

The CP gene was originally found in a virus that occurs in the Philippines, and was cloned into the popular Davao Solo papaya with the use of a Monsanto construct. Upon integration into the papaya genome, the CP gene renders resistance to the virus by triggering the plant's defense mechanism.

Full molecular characterization and environmental data are required by the National Committee on Biosafety of the Philippines prior to the issuance of a confined field testing permit. When completed, the PRSV Resistant Papaya Team is looking forward to testing the efficacy of the candidate lines in actual field conditions.

ABSPII is a USAID-funded consortium of public and private sector institutions that supports scientists, regulators, and the general public in developing countries to make informed decisions about agricultural biotechnology. Where demand exists, ABSPII focuses on the safe and effective development and commercialization of bio-engineered crops as a complement to traditional and organic agricultural approaches. The project helps boost food security, economic growth, nutrition, and environmental quality in East and West Africa, Indonesia, India, Bangladesh, and the Philippines.

Southeast Asia Office
Dr. Desiree M. Hautea
Regional Coordinator
Institute of Plant Breeding
University of the Philippines
Los Baños
College 4031
Laguna Philippines
Telefax: +63 49 5365140
Email: absp2_sea@ipb-uplb.org.ph

US Office
International Programs
213 Rice Hall
Cornell University
Ithaca, New York 14853
USA
Phone: 1 607 255 6357
Fax : +1 607 255 8186
Email: absp2@cornell.edu

Socio-econ Impact Studies on ABSP II Target Biotech Crops Completed

A basic *ex-ante* economic impact analysis was undertaken for each target biotech crop in the Philippines and Indonesia to assess the potential socio-economic benefits of the technology. The impact studies assessed the economic costs and benefits of developing and commercializing transgenic papaya ringspot virus (PRSV) papaya, multiple virus resistant (MVR) tomato, and fruit and shoot borer resistant (FSBR) Bt eggplant in the Philippines; and late-blight resistant (LBR) potato and MVR tomato in Indonesia. A basic environmental assessment was also undertaken to obtain estimates of changes in pesticide use for each biotech crop where it may change with the technology.

A team of local economists was commissioned by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) to undertake the *ex-ante* economic impact analyses. The principal investigators work under the guidance of Dr. George Norton, Professor of Virginia Tech and ABSP II coordinator for socioeconomic studies, specifically in determining data requirements, framework of analysis, and report writing.

Results of the studies affirm the potential benefits the target biotech crops can bring to the farmers. For instance, adoption of biotech papaya resistant to PRSV in the Philippines would likely increase production by about 11,300 kg per hectare and increase net income by as much as 275 percent. The commercial release of FSBR eggplant has high potential to increase marketable yield by 40 percent and net profit by PhP49,800 (USD940) per hectare.

The technology also offers significant savings on pesticide use and associated costs. In the case of MVR tomato technology, there is an expected increase in net income by about PhP76,600 (USD1,400) per hectare in the Philippines. MVR Tomato is likewise expected to provide total economic benefits of between Rp4.62 billion (USD467 thousand) and Rp32.0 billion (USD 3.3 million), with the benefits evenly distributed among producers and consumers. Adoption of biotech LBR potato in Indonesia will likely produce total economic benefits of Rp47.2 billion (USD4.86 million) to as much as Rp205.8 billion (USD 21.2 million).

The principal investigators for the study include Dr. Jose M. Yorobe, Jr. and Mr. Cesar Brian Mamaril, both Economics professors from the College of Economics and Management, University of the Philippines Los Banos (UPLB); Dr. Sergio R. Francisco, chief science research specialist of the Socioeconomics Division, Philippine Rice Research Institute (PhilRice); and Drs. Witono Adiyoga and Mieke Ameriana, economists from the Indonesian Vegetable Research Institute (IVEGRI).

Getting to know our CMV and TLCV strains

Know thy enemy. This famous quote has been the guiding principle of successful warriors in plotting assault strategies against their adversaries. In the same way, this was the inspiration of the Indonesian and Philippine MVR Tomato Teams in their efforts to collect strains of cucumber mosaic virus (CMV) and tomato leaf curl virus (TLCV) that are prevalent in their respective countries.

With various strains collected from major production areas, product developers are now able to fingerprint the viruses they have to deal with such DNA fingerprints can be useful in (1) assessing virus diversity in the region, and (2) identifying genes that could confer resistance to CMV and TLCV by matching them with

Product developers...from page 1

for TLCV resistance, the BL2 facilities for papaya ringspot virus CP-mediated resistance (PRSV-R), and the mass rearing set-up for eggplant fruit and shoot borer (FSB).

After the research briefing, participants visited Bulacan, a province in Central Luzon to interact with tomato farmers. This was followed by a tour to East West Seed Co. Inc., one of the private collaborators of the Philippine MVR Tomato team.

Participants interact with tomato farmers in Bulacan during the field visit.