


Plant Biotechnology at the Institute of Plant Breeding:

Research Highlights and Experiences on Collaboration under ABSPII


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IPB's R & D mandate areas

- **Plant breeding**
 - P.D. 729- establishment of the national plant breeding program to be organized as IPB under the CA
- **Plant genetic conservation and use**
 - P.D. 1046-A established within IPB the National Genetic Resources Laboratory as the national center for germplasm collection and maintenance of important and potentially useful agricultural crops
- **Crop biotechnology**
 - R.A. 7308 (Seed Act of 1992) identified IPB and BPI as lead agencies for crop biotechnology
- **Variety protection and registration**
 - R.A. 9168 (Plant Variety Protection Act) identified IPB as one of the agencies tasked to implement the law

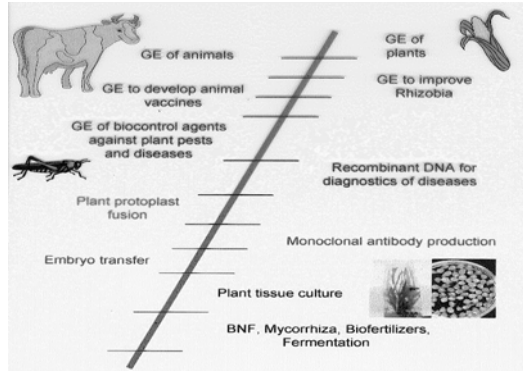



Focus Areas

- Plant cell and tissue culture
- Molecular marker technology
- Gene discovery
- Genetic engineering of crops
- Crop disease diagnostics for breeding applications
- Public outreach and communications


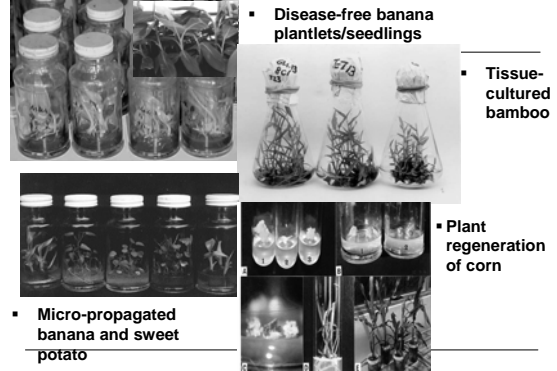


Scope of Biotechnology

Plant Cell and Tissue Culture

PROBLEM	APPROACH	TECHNOLOGIES GENERATED
Disease-elimination	Meristem culture Heat therapy	Disease-free planting materials (e.g. banana) and protocols
Rapid propagation of improved varieties/genotypes	Micropropagation	Protocols and planting materials (e.g. bamboo, rootcrops, Allium)
In-vitro conservation	Micropropagation Cryopreservation	Protocols and in-vitro materials (potato, banana, sweet potato, coconut)
Generation of variation	Somaclonal variation Protoplast technologies Somatic embryogenesis Plant regeneration	Protocols (e.g. tomato, banana, corn, papaya, mango, mungbean, avocado, sweet potato)

- Disease-free banana plantlets/seedlings
- Tissue-cultured bamboo
- Plant regeneration of corn
- Micro-propagated banana and sweet potato

DNA MARKER TECHNOLOGIES

PROBLEM	APPROACH	TECHNOLOGIES GENERATED
Variety/ Hybrid purity	DNA fingerprinting (AFLP, SSR)	DNA fingerprints of elite lines/ commercial varieties (mango, corn, tomato, coconut, etc.)
Trait breeding	Marker-assisted selection (MAS)	Markers for pest and disease resistances, quality (bacterial wilt in tomato, downy mildew and bacterial stalk rot in corn, trips resistance in potato, etc)
Gene discovery	Map-based cloning	Maps and markers for important input and output traits for Philippines crops

HYBRIDITY TESTING USING SSR

§ DNA fingerprinting
 - mango
 - banana
 - corn

§ Line purity testing

Photo Source: 2000 PCA Calendar: PCA-ZRC
 Photo Sources: Cereals Divisions and Genetics Laboratory, IPB

CROP DISEASE DIAGNOSTICS

PROBLEM	APPROACH	APPLICATION/USE
<i>Disease Diagnosis</i>		
RSD - sugarcane	Immunological PCR-based	Easy-to-use diagnostic kit Very sensitive disease diagnosis
Leaf curl gemini virus - tomato	Dot blot hybrid. (DNA probe)	Disease diagnosis & surveys Quarantine, epidemiology
<i>Pathogen Identification</i>		
<i>R. solanacearum</i> (bacterial wilt)	PCR-based Immunological	Rapid and sensitive detection (tomato, eggplant, potato) Rapid detection, quarantine (banana 'Bugtok' disease)
<i>E. chrysantemi</i> (bacterial stalk rot)	PCR-based	Disease diagnosis, epidemiology

▪ Bacterial wilt is the major bacterial wilt disease problem in tomato, eggplant, pepper and tomato

▪ PCR-based detection of *Ralstonia solanacearum* (bacterial wilt)

§ Immunological detection of ratoon stunting disease in sugarcane
 § RSD is the major disease problem of sugarcane growers
 § Immunological detection of yellow leaf curl virus in tomato and pepper
 § Yellow leaf curl virus is widespread among tomato and pepper

Photo Source: Plant Path. Lab, IPB

BIOENGINEERED CROPS

▪ Eggplant with resistance to fruit and shoot borer



Non-Bt Control Bt Egg plant

BIOENGINEERED CROPS


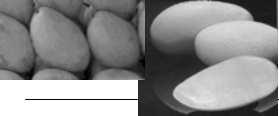
▪ Papaya with resistance to PRSV


▪ Banana with resistance to BBTV

BIOENGINEERED CROPS

- Sweet potato with resistance to FMV
 
- Tomato with multiple virus resistance
 

BIOENGINEERED CROPS


- Papaya with delayed ripening genes for longer shelf-life
 
- Mango with delayed ripening genes for longer shelf-life
 

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Agricultural Biotechnology Support Project II (ABSP II)


<http://www.absp2.cornell.edu>

15

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What is ABSP II?

- Primary focus - *Complement national/regional efforts to develop and commercialize safe and effective bio-engineered crops*
- Scope: *Global*
 - Asia: South and Southeast Asia
 - Africa: West Africa & East Africa
- Sources of support: *US\$ 30M USAID, Missions and matching funds from partners*
- Partners: *47 public and private institutions led by Cornell University*

 Cornell University

Key Features of ABSP II

- Priority setting – bottom up, systematic, participatory process
- Strategic approach = Products

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Strategic Approach = Products

- Focus is on delivering bioengineered products to improve farmer productivity.
- Work with actual products as concrete examples to develop capacity in licensing of IP and the regulatory approval process.
- Improve the focus and productivity of institutional partnerships through products.
- Bring focus to the communications and outreach program by working with actual products.

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Product Commercialization Packages

An Integrated, Holistic Approach to Bio-Engineered Product Development and Commercialization

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Ag Biotechnology Product Path

◆ Genetically modified crops have many technical and performance hurdles and continuous regulatory oversight

Adapted from Teng, 2000

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Priority Products for the Philippines

- Fruit and Shoot Borer Resistant (FSBR) Eggplant
- Papaya Ringspot Virus Resistant (PRSVR) Papaya
- Multiple virus resistant tomato

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Priority Products for the Philippines

- Fruit and Shoot Borer Resistant (FSBR) Eggplant
- Papaya Ringspot Virus Resistant (PRSVR) Papaya
- Multiple virus resistant tomato (MVR tomato)

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Significant Milestones: *FSBR eggplant*

- Technology:
 - F1, BC1 and 2 between transgenic parent source and local Philippine genotypes produced
 - Baseline susceptibility studies on-going

Initial crosses → F1 fruits with BC1 seeds produced

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Significant Milestones: *FSBR eggplant*

- Regulatory:
 - Biosafety approval for contained use approved in December 2005
 - Importation of transgenic materials from India to Philippines endorsed by NCBP in December 2005 and approved by BPI in January 2006, respectively
 - Import permit sent to India in January 2006



Significant Milestones: *FSBR eggplant*

- IP/TT
 - Signing of sub-licensing agreement on January 30, 2006
- Socio-economic studies
 - Ex-ante impact study completed
- Outreach and Communications
 - Product Fact and FAQ sheets
 - Philippine journalists visit to field trial in India



Significant Milestones: *FSBR eggplant*

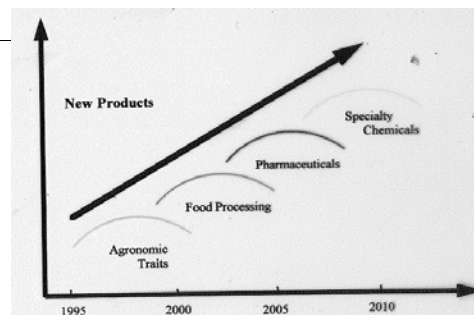
- Capacity building and partnerships
 - 2 Philippines scientists, Mahyco (India)



Partners

- Mahyco (India)
- Sathguru (India)
- Cornell University (USA)
- Virginia Tech (USA)
- ISAAA – SEAsia (Philippines)
- DA-Biotech PIU (Philippines)
- UPLB (Philippines)
 - IPB-CA
 - CPC –CA
- SCUs and DA regional units (Philippines)

Crop Biotechnology Products for the Future



Thank you.