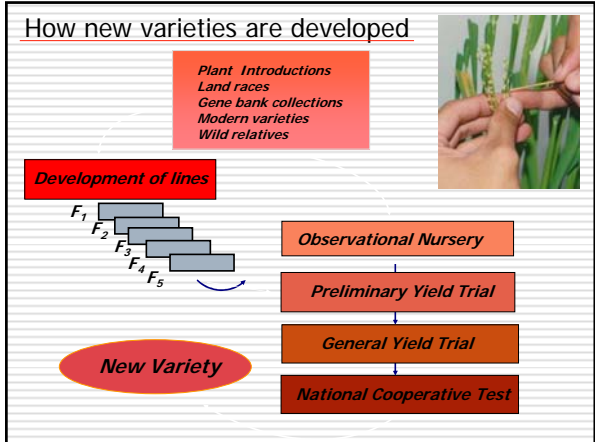


Biotechnology Research at PhilRice

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 Science City of Muñoz, Nueva Ecija



Current Focus of Rice Breeding at PhilRice

- ✓ Irrigated Lowland
 - Transplanted
 - Direct-seeded
- ✓ Rainfed Lowland

Breeding objectives

- ✓ Increased yield
- ✓ Good eating and milling quality
- ✓ Multiple pest resistance
- ✓ Tolerance to abiotic stresses
- ✓ Value-added traits (aroma, pigment)

Emerging concerns: Rice black bug in the south
 Blast problem in the lowlands

Breeding Strategies

- ✓ Conventional breeding
- ✓ Biotechnology
 - In vitro culture
 - Molecular Markers
 - Genetic transformation
 - Gene cloning

Bacterial Blight Resistant Elite Breeding Lines Developed through Marker-Aided Selection

The image shows a hand pointing to a document on the left. In the center is a circular inset showing a gel electrophoresis image with a legend: *Resistant (heterozygous)*, *Susceptible Homozygous*, and *Resistant (homozygous)*. On the right are several rice panicles of different colors and textures, representing the breeding lines.

An Elite BB-Resistant Line Developed Through MAS

PR31563-AR32-19-3-3

- ✓ IR64 background
- ✓ Has the genes *Xa4*, *xa5* and *Xa21*
- ✓ 7.4 t/ha yield; 113 days to maturity; 95 cm tall
- ✓ Recommended this year for varietal release by the Rice Varietal Improvement Group to the National Seed Industry Council



Improved Lines Derived from Existing Varieties through Tissue Culture

- ✓ Tissue culture using different plant parts for inducing genetic variations
- ✓ Anther culture for shortening the breeding cycle
- ✓ Anther culture for purifying hybrid parental lines

The Traditional Wagwag Variety



- ✓ released in 1955
- ✓ premium grain quality
- ✓ tall (150-200 cm)
- ✓ late maturing (165-200 d)
- ✓ salt stress sensitive
- ✓ photoperiod sensitive



AC derives lines moderately tolerant to salinity

- Wagwag V17
- Wagwag V18
- Wagwag V19

In vitro culture-derived Wagwag

Wagwag V9-1 NSIC 130 (Tubigan 3)	For irrigated lowland, high yielding, good grain quality	Released in 2004
Wagwag V19	Saline tolerant, good grain quality	Pre-released (April 2005)
Wagwag V2	Saline tolerant, good grain quality	Pre-released (April 2005)



Wagwag V9-1 - NSIC 130 (Sept. 02 2004)

Xa21 gene from the wild rice *Oryza longistaminata* for bacterial blight resistance



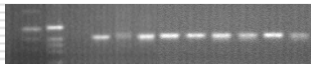
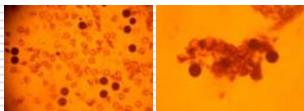
Pin2 gene from potato for stemborer resistance



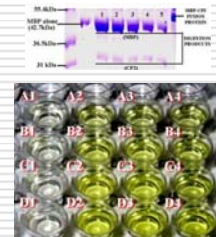
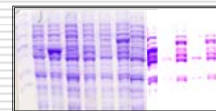
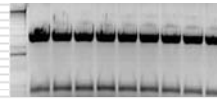
chitinase and *glucanase* genes from alfalfa and rice for sheath blight and blast resistance



Hva1 gene from barley for drought and salinity tolerance



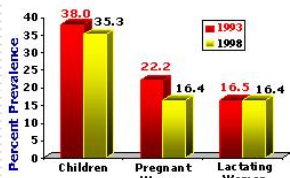
Identification of the rice *Restorer of fertility* gene through transgenic complementation



Cloning and Expression of RTBV coat protein

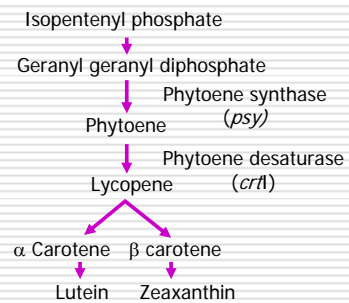
Vitamin A deficiency in the Philippines

The prevalence rate of VAD (deficient to low):
 2 in every 10 pregnant and lactating women
 4 in every 10 children (6 mo. to 5 years)



Data from the FNRI Website

Rice Grain Lacks Two Key Enzymes in the β -carotene Biosynthetic Pathway



Golden Rice – an additional strategy to solve the problem of vitamin A deficiency



IRRI

Introgression of Golden Rice genes into popular varieties



IRRI

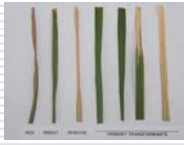
Strategy:

Marker-aided backcrossing and selection

Expected Output:

Golden Rice versions of PSB Rc82 and Mabango 1

Combining Golden Rice, bacterial blight resistance and tungro resistance genes into new elite breeding lines



Strategy:

Hybridization and selection using molecular markers and based on phenotypic observation

Tungro R from several matag lines
Xa21 from IRBB21
But some lines have these genes combined – being used now



Lab Facilities



Dark and Lighted Rooms/Contained Field Testing



CL2 Screenhouses

Ordinary Screenhouse

