

5. IRRI Proposal on Bacterial Leaf Blight

IRRI Proponent or Dr. Frisco Malabanan

Study on Rice Bacterial Blight Resistance and Pathogen Detection on Seeds of Hybrid Rice

(IRRI Ref. No.: DPPC₂₀₀₈ - 90)



Project Components

- **I. Development of bacterial blight-resistant hybrid rice parental lines**



Objectives:

1. Evaluate the resistance spectrum of maintainer and restorer lines used in the hybrid rice breeding program at IRRI against representative bacterial blight races collected in South and Southeast Asia BB resistance genes that are effective against the dominant populations of *Xoo* in these countries/regions;





2. Introgress the BB resistance genes into the best maintainer (B) and restorer (R) lines, with the eventual goal of developing B and R NILs for further hybrid rice breeding.

Activities

A₁. Collect BB isolates from South and Southeast Asian countries/regions (APSA defined, and in collaboration with APSA members to collect, maintain, and evaluate the diversity of the collection on the BB NILs in these countries/regions).

A₂. Identify the parental lines for introgression of the target *Xa* - genes, and collect the desired IRBB NILs or pyramids as donor for crossing work.





A₃. Conduct comparative phenotyping to determine the spectrum of resistance susceptibility of the parental lines and donors to a diverse collection of races of *Xoo* in Asia and Southeast Asia. This could be done in collaboration with APSA members.

A₄. Develop desirable B and R lines with the IRBB NIL or pyramid lines by using traditional phenotypic selection and marker - assisted selection (MAS) at various stages to generate advanced lines, using both *Xa* - and *Rf* - gene markers in the process.



A₅. Produce experimental hybrids by using BB - resistant improved hybrid rice parents.

A₆. Evaluate the above experimental hybrids in the field for agronomic and yield traits, including multi - location testing of new BB - resistant improved hybrid rice lines at hotspots and target countries.



Timeline:

A₁ - 3: One year from August 2008

A₄ - 5: Three years from August 2009

A₆: One year from August 2012



Principal investigators/collaborators

IRRI: Fangming Xie, C.M. Vera Cruz

APSA: APSA Scientists

Resources required

- 1) Total amount of funding required from APSA to IRRI: **\$788,210 in 5 years**
- 2) In - kind contributions by IRRI: IRBB germplasm, other staff time, facilities for phenotyping and MAS, and advanced materials.



- **II. Validation of detection methods of *Xanthomonas oryzae* pv. *oryzae* in rice seed and;**
- **evaluation of its seedborne and seed transmission phase for seed exchange and crop management**

Objectives

The objective is to detect *Xoo* in rice seeds from artificially inoculated and naturally infected seeds. Specifically, we would like to:

- Validate methodologies that have been developed for seed detection using primers designed from the genomes of *Xoo*, *X.o. pv. oryzicola* and xanthomonads; and
- Establish the relationship between pathogen populations from seed and those in the field.



Expected outputs

- 1) Validated detection methods of *Xoo* and other pathogenic and nonpathogenic xanthomonads in hybrid rice seeds.
- 2) Established the relationship between pathogen populations from seed and those in the field.
- 3) The results derived from this study will help much the APSA members in seed movement and seed quarantine process.



The project will include three main activities:

1. Validation of methodologies developed for extraction of *X. o. pv. oryzae* from artificially and naturally infected leaf and seeds.
2. Establishment of threshold inoculum for detection of *Xoo* on seeds important in seed exchange. It is understood here that PCR based assays MAY detect dead *Xoo*, however, it is also possible that the amount of bacteria, dead or alive, will be so low that they would not be 'epidemiologically relevant' populations. We need to find out if this situation is acceptable to regulatory officials.





- 1) Artificially inoculate sets of clean seeds using different levels of inoculum to determine at which inoculum level the set of best primers for *Xoo*, *X.o. pv. oryzae* and xanthomonads will amplify the presence of these specific pathogens and nonpathogens.
- 2) Once a detection threshold is established, validate it using apparently healthy seeds from seed production plots and heavily infected field grown during wet season in farmers' fields, along with the artificially inoculated seeds.



3. Based on the two (2) activities above, develop a protocol for detecting pathogenic xanthomonads on hybrid seeds, in collaboration with Bayer Crop Science, to determine if seedlot can be considered safe or not in terms of preventing possible introduction of the bacterial blight pathogen

Resources required

Total amount of funding required from
APSA to IRRI: \$191,550 in 3 years

In-kind contributions by APSA and
IRRI: other staff time and facilities for
all components of the activities.



Timeline

- A₁: One year from August 2008
- A₂: Two years from August 2009
- A₃: One year from August 2010

Principal investigators

- IRRI: Casiana M. Vera Cruz,
Fangming Xie

