Wide hybridization studies between *O.sativa* (cultivated Asian rice) and *O.nivara* (wild rice)

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Staff involved

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O.nivara

- Found in dry and intermediate zone of Sri Lanka
- AA genome
- No evaluation data related to Brown Plant Hopper (BPH) resistance

O.Nivara – collected near Mahiyangana Raja Maha Vihara

Wide hybridization

- Hybridization with two different species.
- Difficult
- Possible using conventional breeding techniques

Objective

- Collect, screening and transfer of BPH resistant gene from wild rice species (*O.nivara*) to *O.sativa* using wide hybridization technique

Location


Rice Research and Development Institute
Batalagoda,
Ibbagamuwa.

Procedure

- Collection of *O.nivara* accessions
- Screening against BPH
- Wide hybridization
- Generation advancement

Collection of *O.nivara* accessions

- previous wild rice collection data was obtained from Plant Genetic Resources centre and National Herbarium, Royal Botanic garden, Peradeniya
- 14 Collection missions
- 06 districts, Anuradhapura, Matale, kurunegala, Badulla, Puttlam and Polonnaruwa
- Seeds collected for BPH screening

Screening against BPH

- Screened against BPH using Standerd evaluation system (Henrichs *et al* 1985)
- Susceptible check Bg 380
- Resistant check PTB 33

Screening against BPH

- Seeds were germinated at screen house at RRDI
- After 10 days BPH were introduced
- Favorable conditions for BPH were maintained at screen house
- Data were recorded according to the standards
- 1st data set was recorded at Bg 380 showed rating level 05
- 2nd data set was recorded at Bg 380 showed rating level 07

Wide hybridization

- *O.sativa* var. Bg 380 used as female parent
- Selected BPH resistant accession (WRAC 04) used as male parent
- Ten crosses were made
- Bg 380 emasculated by hand
- Pollination was performed with fresh pollen of *O.nivara* accession
- Pollinated spike lets were covered by oil paper bags

Generation advancement

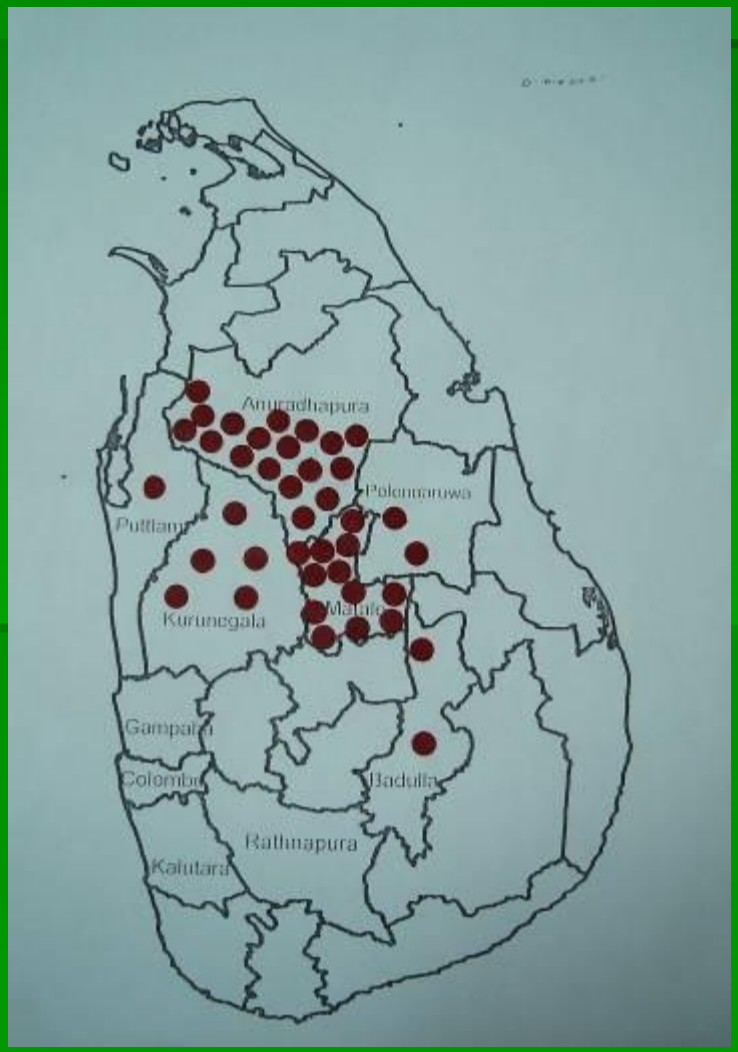
- F1 seeds were planted at RRDI plant cage
- Filled F2 seeds were screened against BPH
- BPH resistant F2 seeds were planted
- This procedure was fallowed till F4 seeds were formed
- F5 seeds were planted at the field as 03 raw progenies

Results

- Forty different accessions were collected from fallowing district

District	No.of accession collected
Anuradhapura	18
Badulla	02
Kurunegala	05
Matale	13
Polonnaruwa	01
Puttlam	01

Collection sites of *O.nivara* accessions



BPH Screening results

Reaction against BPH	No. of accessions
Resistant	03
Resistant/ moderately Resistant	15
moderately Resistant	15
moderately Susceptible	03
Susceptible	04

Wide hybridization results

- Forty- two F1 seeds were formed
- All are germinated
- More vigorous F1 plants were observed

Parents

- *O.sativa* var Bg 380
- Mother plant
- BPH susceptible variety

- *O.nivara* WRAC 04
- pollen parent
- BPH resistant accession

After hybridization

...Progress

- F_1 seeds
- Planted at plant cage

F_1 plants

- Vigorous plants
- Plant height In between parents
- High percentage of empty seeds

Average plant height of parental lines and F1s

O.Nivara WRAC 04	*O.Sativa* var. Bg 380	F1 plants
130 cm	95 cm	112 cm

Results con...

- All F1 plants produced F2 seeds
- Only 10% were filled
- Fill seed percentage were increased with generation advancement

F_2 to foam seeds

- Only straw color seeds –fill

% filled seeds, % resistant plants with generation

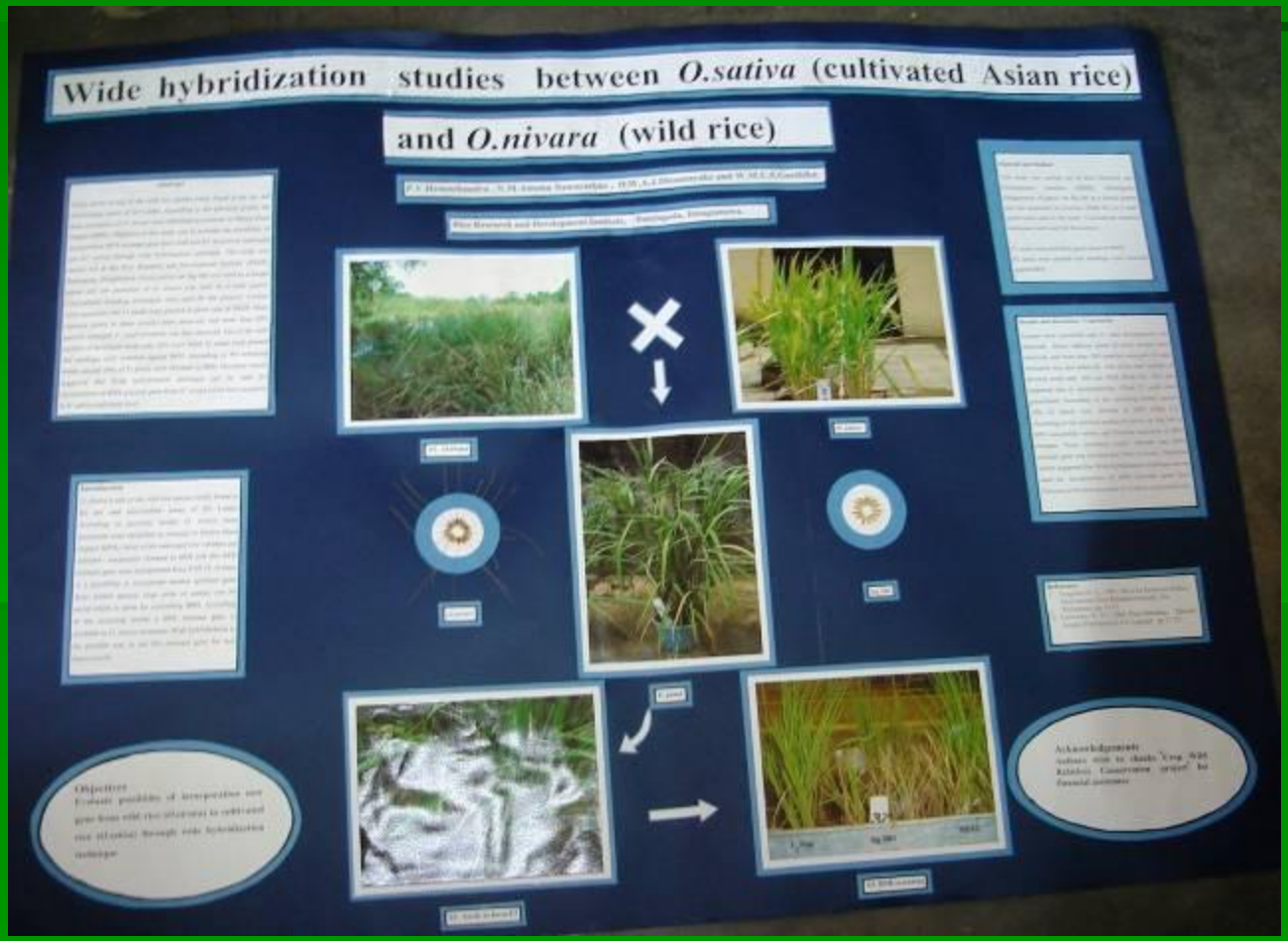
Generation	% filled seeds	% resistant plants
F1	100	-
F2	10	30
F3	60	50
F4	90	92

Screening for BPH resistance

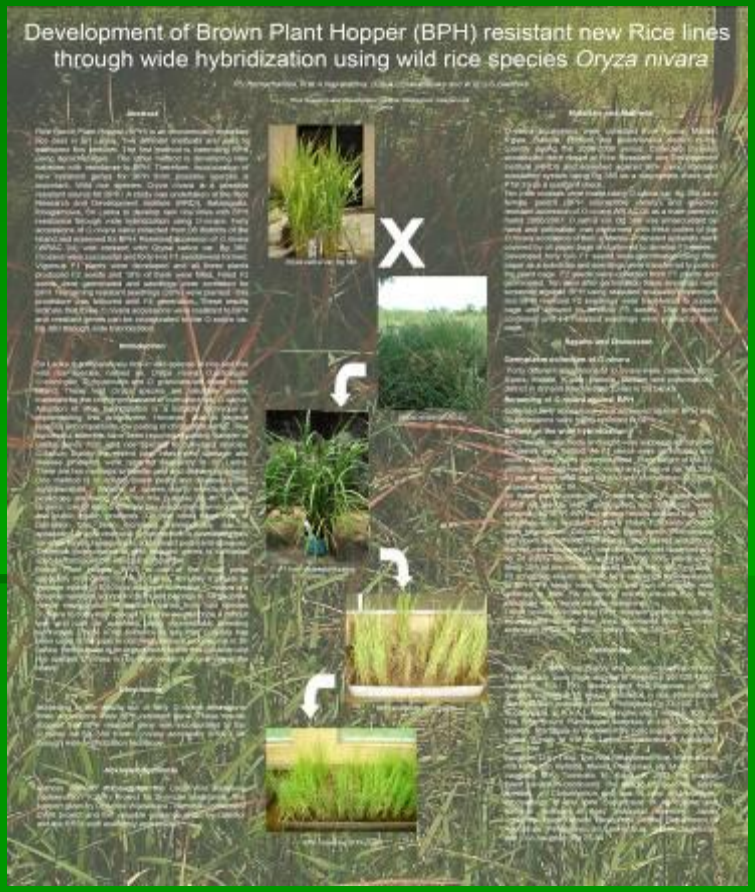
Screening F2 plants

Screening F4 plants

Progress published ASDA 2008



Results published at Rice Genetic symposium (RG6) at Manila, Philippine 2009



Related molecular studies

- Investigation of Brown Plant Hopper resistance in *Oryza nivara* and *Oryza eichingeri* derived lines
- S.A.P.Madurangi *et al 2008*

Conclusion

- Three *O.nivara* accessions have BPH resistant genes.
- Wide hybridization results suggest that BPH resistant gene from *O.nivara* WRAC 04 can be incorporated to O.sativa var. Bg 380.
- Molecular studies confirmed these findings

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Thank you