Wheat Blast: Current Status and Progress in Phenotyping

PK Singh¹, X He¹, AK Joshi¹, RP Singh¹, F Marza² and NCD Burma³

¹International Maize and Wheat Improvement Center, Apdo. Postal 6-641, 06600 Mexico DF, MEXICO
²Instituto Nacional de Inovacion Agropecuaria y Forestal, La Paz, Bolivia
³Bangladesh Wheat and Maize Research Institute, Dinajpur, Bangladesh
Wheat Blast

- Caused by *Magnaporthe oryzae* pathotype *triticum* (MoT)
- Wheat blast is seedborne & airborne disease
- Resistance now known however limited knowledge on genetic basis
- MoT population is very diverse, exhibits many pathotypes that could cross-infect different hosts and overcome resistance.
- Fungicide schemes are partially effective under medium to low disease pressure. Pathogen shows ability to develop fungicide resistance.
- Can attack any aerial parts of wheat plant but disease is seen mainly on spikes
Wheat Blast - Symptoms

- Seedling leaf
- Stem
- Awn & glumes
- Bleached spike
- Grains shriveled, poorly developed

Eye shaped lesion on leaf
Wheat Blast

• Discovered in Parana State of Brazil in 1985 and since then spreading to an area of about 3.0 mha causing losses of 10-100% depending on years, genotypes, planting date and environment.

• Reported in C & S Brazil, low lying areas of Santa Cruz region of Bolivia, S and SE Paraguay, and NE Argentina.

• Observed in Bangladesh in 2016
Wheat Blast in Bangladesh

**2015-16:** 1\textsuperscript{st} report of WB occurrence in Bangladesh in 7 districts. Losses: 25-30%

**2016-17:** Disease spread to three more districts. Losses: 5-10%

**2017-18:** Conditions unfavorable for disease development. Spread to additional 5 districts. Losses: 1-5%

**WB is an established disease in Bangladesh**

**OFFICIALLY** India does not have wheat blast
Areas Vulnerable to Wheat Blast in Bangladesh, India and Pakistan

Mottaleb et al.  
**Ex-Ante Analysis: Impact of Wheat Blast in India, Pakistan and Bangladesh**

<table>
<thead>
<tr>
<th>Country</th>
<th>Wheat area (m. hac)</th>
<th>Area WB vulnerable (m. hac)</th>
<th>Production (m. ton)</th>
<th>Per capita use (kg/year)</th>
<th>Losses due to WB (10%) (0000- ton)</th>
<th>Economic loss (m. USD)</th>
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<tbody>
<tr>
<td>Bangladesh</td>
<td>0.43</td>
<td>0.28</td>
<td>1.25</td>
<td>8.6</td>
<td>85.14</td>
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<td>India</td>
<td>30.90</td>
<td>6.57</td>
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<td>TOTAL</td>
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<td>6.99</td>
<td>123.01</td>
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Bangladesh is net importer of wheat  
India & Pakistan are self sufficient with limited export (IND) or import (PAK)
Wheat Blast

Resistance to blast in South America

• Cultivars derived from CIMMYT line Milan appear to have resistance under field conditions (Kohli et al., 2011).
• Translocation 2NS has reported to play role in blast resistance.
• Milan possesses the 2NS segment (Cruz et al., 2016).
Precision Phenotyping Platform for Wheat Blast in Bolivia and Bangladesh

Quirrusillas

Latitude: 18.20 S
Longitude: 63.56 W
Altitude: 1494 masl
Crop Cycle: Dec.-April

Jessore

Latitude: 23.13 N
Longitude: 89.20 E
Altitude: 7 masl
Crop Cycle: Dec.-April

Okinawa

Latitude: 17.13 S
Longitude: 62.54 W
Altitude: 267 masl
Crop Cycle: May-August
Precision Phenotyping Platform at Jessore
# Top Performers on Wheat Blast Resistance Across Environments

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<td>WAXWING/KIRITATI//KACHU</td>
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</tbody>
</table>

- 2NS carriers usually showed good and stable resistance
- Non-2NS lines were more susceptible and unstable across environments
- It is imperative to search for non-2NS resistance sources
Borlaug 100, BARI Gom 33 with few lines have showed resistant reaction, while BARI Gom 26 displayed highly susceptible reaction.
Preliminary Results from 50th IBWSN

Manhattan plot

Blast (Quirusillas, Bolivia, first planting)

Blast (Quirusillas, Bolivia, second planting)
Preliminary Results from 35th SAWSN

Manhattan plot

Blast (Quirusillas, Bolivia, first planting)

Blast (Quirusillas, Bolivia, second planting)
Reaction of 100 Lines from India (2017)

2NS lines = 31
Non 2NS lines = 63
6 lines - not sure??

4 lines had scores of ZERO
1. NI5439/MACS2496
2. ROLF07*2/KACHU#1
3. UP2556//ID13.1 /MLT/3/ESWYT70
4. PFAU/MILAN/5/CHEN/AE.SQ(TAUS)//BCN/3/VEE#7 /BOW/4/PASTOR

15 lines with scores 1-10
BARI Gom 33: Blast resistant and biofortified variety released in Bangladesh

- Kachu/Solala; 2NS segment for blast resistance
- + 7 ppm Zn advantage; 5-10% higher yield than the best check; Yield = 5 t/ha

Challenge: Large scale faster dissemination in Bangladesh; seed multiplication in Mexico/India.
It is UP state trial as BHU 35
Thank you for your interest!