The objectives of this study were to characterize the three genes used in our 3R-gene FTFBPP and to further evaluate the resistance strength of *P. infestans* population in Bangladesh and Indonesia isolates to know the genetic composition of the genes.

The Project

The Feed the Future Biotechnology Potato Partnership is a USAID funded multi-institution cooperative agreement to use cutting edge bioengineering technology to improve farmer and consumer preferred potato varieties in Indonesia and Bangladesh. Biotech potato products, currently in production, have stacked resistance genes, offer broad-spectrum resistance to late blight (*Phytophthora infestans*), the most devastating potato disease in the world. Once the products complete in-country governmental regulatory approval, our project’s stewardship plan will work with in-country government institutes and seed industry partners to distribute to smallholder farmers in Indonesia and Bangladesh.

The Partnership

The project is based at Michigan State University and is collaborating with scientists at University of Minnesota and University of Idaho. The J.R. Simplot Company is an invaluable industry partner. Our in-country collaborators are the Bangladesh Agricultural Research Institute (BARI), the Indonesian Center for Agricultural Biotechnology Genetic Resources Research and Development (ICABIograd), the Indonesia Vegetable Research Institute (IVEGRI), and the International Potato Center (CIP) program in Kenya.

**Training and Capacity Building**

The Feed the Future Biotechnology Potato Partnership provides strategic human and institutional capacity building support to in-country partners to ensure sustainable use of agricultural biotechnology for future generations. Scientist from both countries came to MSU for training sessions that included tissue culture handling, molecular analysis, greenhouse hydroponics and pathology research during 2017.

**SP951 Legacy Potato Product**

The KatSP951 Legacy potato product (containing a single R gene) was developed during a previous USAID funded project through Cornell University called ABSPII. Both Bangladesh and Indonesia planned on deregulating this event when the funding ended. USAID mandated that our project review the data collected. We found the regulatory dashboards were missing several important analyzes. Our project completed experiments and found that a unique insertion occurred in the single gene KatSP951 event.

**Proof of Concept**

A proof of concept, testing the effectiveness of 3 R-gene technology, was completed using technology developed by CIP-Kenya. MSU transformed a 3R-gene plasmid (pCIP99) into the Diamant variety and 15 DiaCIP99 events were selected and field tested at MSU’s Clarksville Research Center in Clarksville, MI during the 2017 growing season. The events were compared with Atlantic (non-transgenic), Diamant (non-transgenic), and Katahdin SP951 (single R-gene potato). The DiaCIP99 events showed very high levels of resistance.

**Pathology Update**

Late Blight Isolate Analysis

The objectives of this study were to characterize isolates to know the genetic composition of *P. infestans* population in Bangladesh and Indonesia and to further evaluate the resistance strength of the three genes used in our 3R-gene FTFBPP potato products.

- All the isolates collected in Indonesia differed from US and Europe reference isolates. Based on the SSR markers, Indonesian isolates clustered into one of three different groups.
- The Bangladesh isolates closely related to European genotype Blue 13.
- No virulent alleles of Avr-vnt1, Avr-blb2, Avr2, or Avr-Bbl1 effectors were found in five isolates (AT1, AT2, GR1, GR2 and GR3).
- A more extensive survey of isolates from different locations looking at mating type, mitochondrial haplotype, RFLP analysis with probe RG57, allozyme analysis, mfenoxam sensitivity test and pathogenicity is planned.

A border row: Atlantic (non-transgenic) (2 on left, 2 on right); center 4 rows include: Diamant, Katahdin SP951, and DiaCIP99 events.

**Product Development Update**

**Simpot 3R-Gene Product Development**

<table>
<thead>
<tr>
<th>Simpot 3 R-genes (Rpi-Vnt1, Rpi-Blb2 and Rpi-Mq1) &amp; NptII (plant selection marker-gene) vector</th>
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<tr>
<td>Transform potato cultivars Granola and Diamant</td>
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<td>DNA isolation and endpoint PCR analysis for all R-genes</td>
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<td>Vector backbone analysis (qPCR)</td>
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<td>Copy number/locus number (ddPCR)</td>
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<td>Selection of events with single copy number and no backbone</td>
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<td>Trait efficacy (<em>Phytophthora infestans</em> infection) with detached leaf bioassays</td>
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<td>Field performance testing at MSU and in target countries Diamant 2019, Granola 2020</td>
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**Completed** | **In Progress**