

## Cluster 2 – Non-confidential Summary

### 1. CLUSTER PROJECT DETAILS

**Project number:** AIP-CL03

**Name of Project:** Pulse Science Cluster 2

**Activity #:** T1.G2.V1

**Name of Activity:** Dry Bean Improvement for Sustainable Production in Canada

**Name of Sub-activity 5:** Development of dry bean germplasm and varieties adapted to SW Ontario

**Project research period:** April 1, 2013 to March 31, 2018

**Principal investigator and research collaborators:** Peter Pauls and Frédéric Marsolais

### NON-CONFIDENTIAL ABSTRACT/SUMMARY (For use in publications and pulse grower websites)

The overall objective of this activity is to address dry bean production constraints to maximize economic returns to growers and ensure long term sustainability of the dry bean industry in Canada by developing new adapted bean varieties, with multiple disease resistances, higher yields, greater nitrogen use efficiencies, and improved seed quality.

Several biotic and abiotic factors pose significant risks to the bean production industry in Canada. Therefore, the project targeted the development of bean varieties with reduced risk and with reduced dependence on pesticides and fertilizers, leading towards the development of more sustainable bean production practices in Ontario. The work included broadening bean germplasm diversity by conventional plant breeding, advancing the material to a true breeding condition and extensive testing for yield, maturity, plant architecture, disease resistance, canning suitability, nitrogen fixing capacity, and seed coat colour. In addition, the work included the development of bean germplasm that does not darken after harvesting since darkening reduces the commercial value of light coloured beans like cranberry and pinto beans.

The breeding work was initiated and co-ordinated by the University of Guelph in close collaboration with the Agriculture Agri-Food Canada (AAFC) personnel at London and Harrow. The field trials are mostly performed at Elora and Woodstock by the Guelph group and St. Thomas and Harrow by the AAFC group. On average, 150-250 new crosses were made each year between lines within and among navy, black, cranberry, kidney, and pinto bean market classes. The materials were advanced to homozygosity by: bulk advances of 800 F2-F5 families, selecting single plants from the F5 families, testing selections in in-house yield trials for two years, and testing the best lines in provincial registration trials for two years. Typically, 10-15 lines were entered into the provincial trials each year and 1-4 lines were supported for registration each year.

The bean breeding program supported by this project developed common bacterial blight (CBB) resistant lines navy bean lines (such as Lighthouse Apex and Mist) as well as Anthracnose resistant white bean varieties such as Bolt. Our most recently developed lines navy bean lines (like Fathom and Argosy) combine both resistances into single varieties. This combination of disease resistance characteristics in dry beans will mitigate economic losses and reduce pesticide use, thus protecting the environment and Canadian consumers. Bean diseases, like CBB and Anthracnose, are responsible for 10% losses in crop yields annually resulting in losses worth approximately \$25M for the bean industry in Canada. This is in spite of spending on average over \$25/acre on disease control agents. In addition, the development of CBB and Anthracnose-resistant varieties may ultimately be the basis for the establishing a local certified seed production industry in Canada, thus reducing grower seed costs. Furthermore, several high yielding kidney bean lines were developed, including: Dynasty, Inferno, and Yeti.

Genetic information is fundamental to our ability to continue to make advances in bean breeding. The information that was obtained about the genetic relatedness among accessions in Ontario bean germplasm is critical for making decisions about which materials to use in crosses and the insights that we have obtained from genetic studies of traits, like CBB resistance and seed coat darkening, provided tools for selection that allow us to be more precise and efficient in identifying individuals with desired characteristics.

Data from the Registration and Performance trials is published on the Ontario Pulse Crop Committee (OPCC) GoBeans website (<http://www.gobeans.ca>).

Completed report to be sent to [stoms@saskpulse.com](mailto:stoms@saskpulse.com) by March 30, 2018