

## Breeding for Sustainable and Profitable Dry Bean Production

**Principal Investigator:** Dr. Peter Pauls

**Institution:** University of Guelph, Guelph, Ont.

**Prepared by:** Nate Ort, M.Sc.

This project led by Dr. Peter Pauls at the University of Guelph (Plant Agriculture) developed dry bean varieties with high yield and seed quality, generated knowledge and breeding material for future initiatives, and aided in training next generation plant scientists.

### Variety Development

The overarching and continuing goal of this project is to develop elite dry bean varieties for Ontario farmers with robust disease resistance, high yield and seed quality, and improved nitrogen use efficiency. The investigator's breeding pipeline is supplied with new material initiated in controlled environments and are maintained and advanced by tests at each pipeline stage as they are selected for yield, disease resistance, and seed quality. The final step in developing new varieties involves testing promising material close to commercialization in advanced yield trials in the Performance and Variety Trials co-ordinated by the Ontario Pulse Crop Committee (OPCC) at several locations in Ontario and in seed cooking trials led by Dr. Parthiba Balasubramanian (Agriculture and Agri-Food Canada, Lethbridge, Ont.).

In the last year this program completed another successful cycle in the ongoing variety development pipeline. Several thousand dry bean lines and populations at different levels in the pipeline were characterized in the field, laboratory, and cooking quality lab, and promising material was disclosed to the University of Guelph and tested in OPCC registration trials. Based on their performance, the OPCC Variety Subcommittee provided support for the registration of six dry bean varieties in different market classes and the University of Guelph licensed three registered varieties to two seed production businesses. Applications for variety registrations were submitted for: Navy bean (2): OAC Seal, OAC Souper; Kintoki bean (1): OAC Sunrise; and Pinto bean (3): Stavros, ME78, XPT One. These varieties are expected to provide farmers with high yield, desired plant architecture, and strong disease resistance. The performance and characteristics of dry bean varieties registered in Ontario can be reviewed using the [GoBeans Variety Comparison tool](#) on the OPCC website.

The dark red kidney bean OAC Dynasty, developed by this breeding program, was awarded the 2022 Canada-wide Seed of the Year Award. This was supported by the Ontario Bean Growers and was awarded because of its high yield and dominance in Ontario kidney bean production.

### Next Generation Scientists

This project and the investigators involved also contributed to the training of graduate students and postdoctoral fellows, the next generation of agricultural scientists. The knowledge generated by these researchers included insights into the genetic and molecular control of common bacterial blight (CBB) resistance, yield, harvestability, adaptation, and seed quality traits like protein concentration and seed coat colour.

#### Dr. Fawn Turner

Dr. Turner completed a PhD at the University of Guelph under the supervision of Dr. Pauls. Their research evaluated the material tested in the University of Guelph dry bean breeding program for their relationship between the genetic makeup of each line and the traits expressed in the field. The findings from this extensive study have provided dry bean breeders with increased knowledge and understanding of dry bean yield, adaptation, architecture, and disease resistance. Dr. Turner is now a biology instructor at Okanagan College.

#### Maryan Vazin

Vazin is a PhD candidate studying the genetic control of yield, disease resistance, and seed quality in navy bean. The field experiments conducted so far have tested genetic assisted selections for yield and will be a valuable resource for this program in future testing years.

#### Sajida Noor

Noor is researching cranberry bean seed colour as a part of her PhD studies at the University of Guelph. This initiative explores introducing the desired genes controlling seed colour into elite cranberry varieties intended for registration and commercialization.

#### Holly Gallo

Gallo is a M.Sc. student developing genetic methods to select dry bean varieties for high seed protein. This involves evaluating seed protein concentration in popular commercially available varieties, a survey of novel dry bean material intended for the breeding pipeline, and investigating the control and introduction of genes that increase seed protein concentration.

#### Dr. Greg Perry

Dr. Perry is a postdoctoral researcher and has been characterizing the genetic background of core dry bean material used in this breeding program. This research supports several initiatives of this program including the research conducted by graduate students and the understanding of CBB resistance among the breeding material intended for commercialization.

### Key Findings

- Six varieties submitted for registration
- Three registered varieties licenced to two seed production businesses for commercial use
- One completed PhD, four highly qualified personnel being trained