University of Manitoba | Faculty of Graduate Studies

Ph.D. Oral Examination

Keval Shah, Ph.D. Candidate
Plant Science

The oral examination of the doctoral thesis titled

Introgression of Blackleg Resistance Genes from Related *Brassica* species to *B. napus*

will be held on

Monday, April 8th, 2024, at 09:00 AM (CST)

218 Plant Science Building

Examining Committee

Advisor: Dr. Robert Duncan, Department of Plant Science
Co-Advisor: Dr. Claudio Stasolla, Department of Plant Science

Examiners:
Dr. Curt McCartney, Department of Plant Science
Dr. Nandika Bandara, Food and Human Nutritional Sciences

External Examiner:
Dr. Gavin Chen
Department of Agricultural, Food and Nutritional Science
University of Alberta

Chair

Dr. Xiaopeng Gao, Department of Soil Science

Thesis Abstract

GENERAL ABSTRACT

Canola (*Brassica napus* L.) is one of the most important oilseed crops, contributing more than $26 billion annually to the Canadian economy. Blackleg is caused by fungal plant pathogen *Leptosphaeria maculans* (Desm) Ces. et de Not. In canola, blackleg disease causes more than $1 billion in yield losses globally. There are different disease management strategies, and using resistant cultivars is one of the economically viable and environmentally sustainable approaches. There are reports of a breakdown of blackleg disease resistance in Australia, France, and Canada due to severe pathogen pressure. Twenty-two blackleg-specific resistance genes have been identified in different *Brassica* species. Out of these, the B-genome blackleg-specific resistance genes provide resistance throughout a plant's life. This thesis addresses the identification of putative novel sources of resistance from *Brassica juncea* and hexaploid *Brassica* into *B. napus*. In the first project, different *B. juncea* UM lines were used to identify a high level of resistance against blackleg disease and were screened with *L maculans* isolate 03-15-03 (*AvrLm2*, *AvrLm3*, *AvrLm5-9*, *AvrLm6*, *AvrLm10*, and *AvrLm11*) and PG4-1-M (*AvrLm2*, *AvrLm5-9*, *AvrLm6*, *AvrLm10*, and *AvrLm11*). Plants were inoculated with different *L. maculans* (*AvrLm3* and *avrLm3*; *AvrLm5 AvrLm6*, *AvrLm5 avrLm6*, and *avrLm5 avrLm6*) isolates to identify the novel source of resistance in *Brassica napus* Westar x *Brassica juncea* UM3073 (UMBJ16) genotypes. For genotyping, UMBJ16 genotypes were tested for all the available blackleg-specific resistance gene-linked Kompetitive Allele-Specific PCR (KASP) (*Rlm1*, *Rlm2*, *Rlm3*, *Rlm4*, *Rlm7*, *Rlm9*, *LepR1*, *LepR2*, *LepR3*, and *LepR4*) and Simple Sequence Repeats (SSR) markers (*Rlm6* and *rjlm2*). In the second project, the B-genome blackleg-specific resistance genes were introgressed from hexaploid *Brassica* into *B. napus*. Similar phenotyping and genotyping approaches were followed to identify the putative novel source of resistance against *L. maculans* isolate 03-15-03 and PG4-1-M in *Brassica napus* Westar x hexaploid *Brassica* crosses (BNHB16). This resulted in the identification of a putative novel source of resistance against *L. maculans* isolate PG4-1-M in UMBJ16 and BNHB16 genotypes. This newly developed germplasm will help to develop blackleg-resistant breeding material in canola and rapeseed breeding programs.