Secondary Dormancy Potentials of a Diverse Set of *Brassica napus* L. Lines Grown in Different Environmental Conditions

Caroline Brown\(^1\); Sally Valli\(^1\), Steve Shirtliffe\(^2\)
\(^1\)Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, SK
\(^2\)Department of Plant Sciences, SK Campus Drive, University of Saskatchewan, Saskatoon, SK

### Introduction
- Volunteer canola is the 4th most prevalent weed on the Canadian prairies and creates issues for control in other rotational herbicide tolerant crops (Beckie, 2015).
- Secondary dormancy is the physiological mechanism leading to the extended presence of canola seed in the weed seed bank (Gulden et al., 2004).
- Dormancy is classified as the failure of a viable seed to germinate in favourable conditions.
- Secondary dormancy is induced after the seed is released from the mother plant and is due to adverse conditions including low temperature and low moisture (Baskin and Baskin 1998).
- Secondary dormancy in *B. napus* exists as non-deep physiological dormancy, meaning the seed cycles between dormant and non-dormant states (Baskin and Baskin 1998).
- Stratification (cycling of light and/or temperature) can break non-deep physiological dormancy (Baskin and Baskin 1998).
- Induction potential for secondary dormancy varies greatly among *B. napus* lines and is largely influenced by the environment and genetics (Pekrun et al., 1997).

### Objectives
- Determined the secondary dormancy potential of a diverse set of *B. napus* L. lines grown in different seed growing conditions.
- Hypothesized that among the 51 unique lines a wide range of secondary dormancy potentials will exist.
- Hotter seed production sites will produce seed with lower secondary dormancy potentials.
- Secondary dormancy potentials will later be used for correlation with seed vigour traits and seed storage protein profiles.

### Materials & Methods

**Nested Association Mapping population (NAM) parental lines screened**
- Spring (annual) *B. napus* L. lines
- Collection of 51 lines selected for their genotypic and phenotypic diversity
- Three maternal environments examined (2015 Saskatoon SK; 2016 Temuco, Chile [1]; 2016 Los Angeles, Chile [2])
- Immediately following harvest the seed lots are frozen to maintain highest level of dormancy.
- Four technical runs are performed to screen for secondary dormancy

**Rapid Dormancy Induction Protocol** (Weber et al. 2006)
- 7 day and 2 dose under greenlight (495-570 nm)
- Dormancy induction
  - Polyethylene glycol 6000 (PEG) (Calbiochem®, France) solution
  - Dormant potential of -1.5 MPa at 20°C.
- 20°C for 7 days in dark germination cabinet
- Germination test
  - 10 ml of distilled water
  - 20°C for 7 days in dark germination cabinet
- Viability test
  - 10 ml distilled water on top of blotter paper
  - Temperature cycling 20°C for 16 hours and 30°C for 8 hours for 7 days in darkness

**Dormancy potential** = (# of non-germinated seeds/ total # of viable seeds) * 100

### Results

**SK Secondary Dormancy Potential**

**Chile 1 Secondary Dormancy Potential**

**Chile 2 Secondary Dormancy Potential**

### Conclusions and Future Research
- A wide range of secondary dormancy potentials were observed across maternal sites and lines.
- Strong correlation coefficient between runs from the same maternal environment ($r > 0.7$).
- Some lines are not performing consistently between runs of the same environment (Ex. #32 SK; #36 SK; #47 SK)
- Some lines are not performing consistently across environments (Ex. #22 SK and Chile 1; #23 SK and Chile 1; #26 SK and Chile 1; #27 SK and Chile 1)
- Two more runs are in progress.
- Seed vigour traits to be examined include germination potential, precocious germination, electrical conductivity, controlled deterioration and pre-chill germination.
- Seed storage proteins (SSP), napin and cruciferin, are to be profiled.
- Secondary dormancy potentials used for correlation with seed vigour traits and seed storage protein profiles.

### References


### Acknowledgements

- Maple Leaf, 2016. Sourced from https://mapleleaf.ca/seedlife/seedlife