Scarification and Environmental Effects on Germination in Minnesota Hardy *Prunus* Seeds

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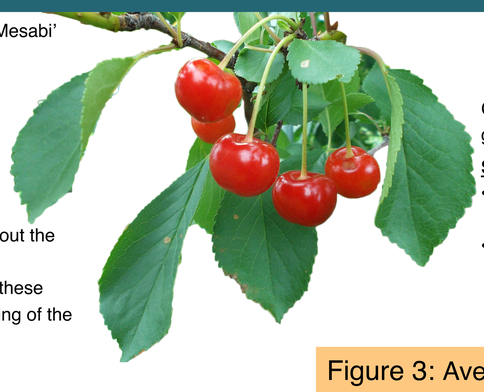
P. salicina x P. americana 'Hennepin'

Introduction



P. cerasus 'Mesabi'

Deep physiological and mechanical dormancies must be overcome for seeds of *Prunus* species to germinate. Dormancy is overcome by periods of cold stratification of 90-150 days for many species. Additionally, some species require warm stratification and/or scarification. Even after cold stratification, germination in *Prunus* species is low. Additionally, little is known about the germination requirements of *Prunus* cultivars bred for conditions in USDA Zones 3 and 4. Elucidating the germination requirements of these cultivars will aid breeding efforts as well as help further understanding of the reproductive biology of these species.

Questions

1) Does seed germination vary among hardy *Prunus* cultivars?
2) Is scarification required for germination in hardy *Prunus* cultivars?
3) Does long term cold, dry storage of seed affect germination?

Materials and Methods

3 apricot cultivars: *P. armeniaca*
4 cherry cultivars: *P. cerasus*
12 plum cultivars: *P. domestica, P. americana x P. salicina, P. besseyi x P. hortulana miniri*

- Plum and tart cherry seeds were collected in 2012 and 2014; dried and refrigerated.
  - 2012 seed stored and used in 2012 and 2014 experiments.
- Apricot seeds were collected in 2012 and 2013; there was no crop for Moongold in 2013 and no apricot crop in 2014.
- All seeds were planted and placed in warm stratification (Figure 1). Pots were filled with germination mix for greenhouse; field soil for field. Pots, in the field, were covered with screening (Figure 2).
- Data were analyzed to determine the effect of scarification and storage;
  - Across species for each year and environment
  - Within each cultivar/environment/year

Figure 1: Diagram of experimental protocol per cultivar

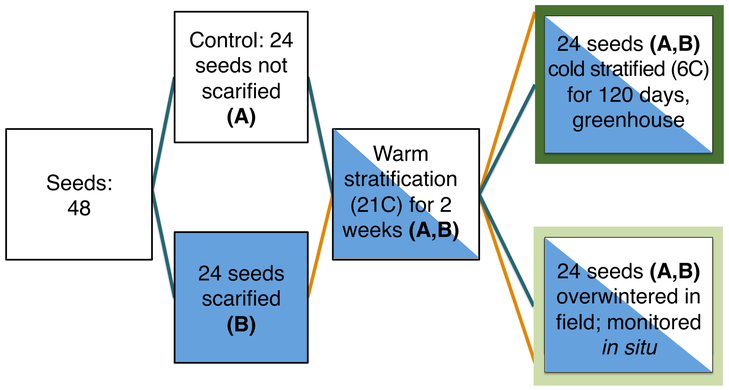


Figure 2: Greenhouse and field experiment establishment

Selected Literature

Baskin, J. M., & Baskin, C. C. (2004). A classification system for seed dormancy. Seed Science Research, 14(01), 1-16.

Iliev, N., Petrakieva, A.,& Milev, M. (2012). Seed dormancy breaking of wild cherry (*Prunus avium l.). Forestry,* 18(1), 43.

Martinez-Gomez, P., & Dicenta, F. (2001). Mechanisms of dormancy in seeds of peach (*Prunus persica* (L.) Batsch) cv. GF305. *Scientia Horticulturae.* 91(1), 51-58

Acknowledgements

Minnesota Landscape Endowed Chair of Research
Minnesota Agricultural Experiment Station
Applied Plant Science Program Fellowship
Members of the Anderson, Hoover and Luby labs
UMN Plant Growth Facilities staff
Chad Giblin

Results

Germination percentages varied among cultivars in both years and environments with the highest germination percentage in apricots (Figs. 3, 4, 5).

Scarification

- When species were combined within an environment and year, a significant effect of scarification occurred in the 2012 and 2014 greenhouse environments (p-value ≤ 0.01).
- The main effect of scarification was not significant in the 2012 and 2014 field. However, the interaction term between scarification and cultivar was significant in the 2012 greenhouse and field which could be the result of the significant cultivar main effect.

Storage

- There was a significant effect of cold, dry storage in the 2014 field environment (p-value ≤ 0.05) when species were combined.
- The main effect of storage was not significant in the 2014 greenhouse environment. However, the cultivar by storage interaction (p-value ≤ 0.01) and cultivar by storage by scarification interaction (p-value ≤ 0.05) were significant in the greenhouse environment which could be the result of the significant cultivar and scarification main effects.

Figure 3: Average % germination in **apricots** for 2012 & 2014.

No significant differences between control and scarified, or fresh and stored seed within cultivar.

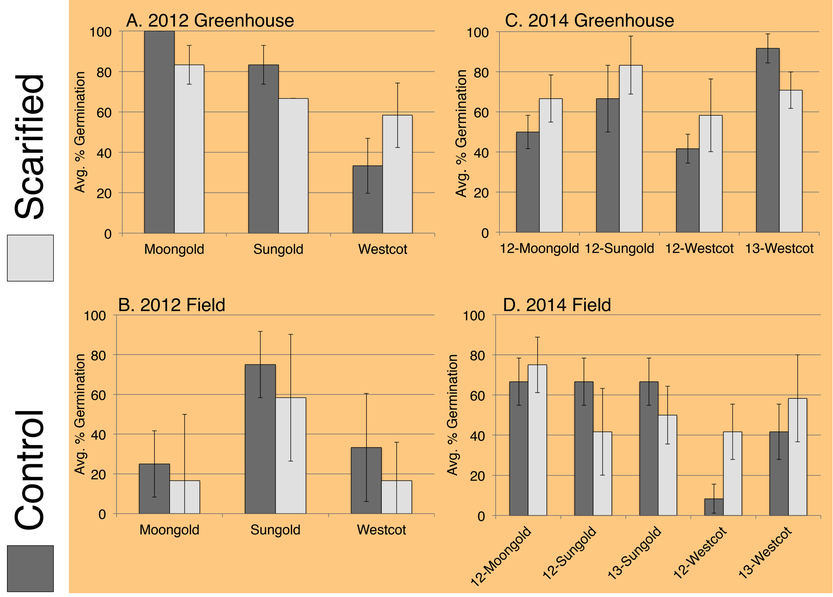


Figure 4: Average % germination for **tart cherries** in 2012 & 2014.

Scarified – significant differences ✦ at p-value ≤ 0.10 for:
- Fig. 4A 'Meteor'
- Fig. 4B 'Suda'
- Fig. 4C 'Meteor'

Storage - significant differences at p-value ≤ 0.10 for:
- Fig. 5D 'Bali' & 'Meteor'

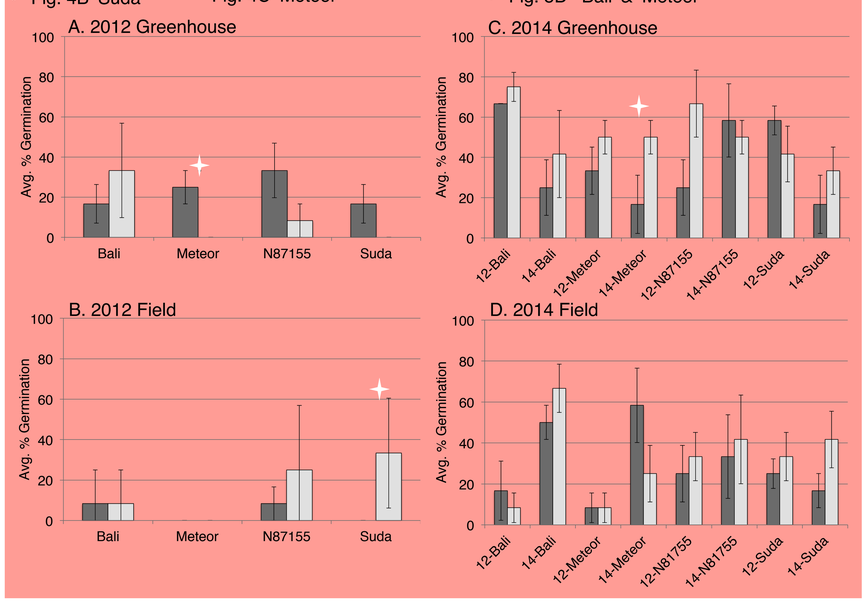


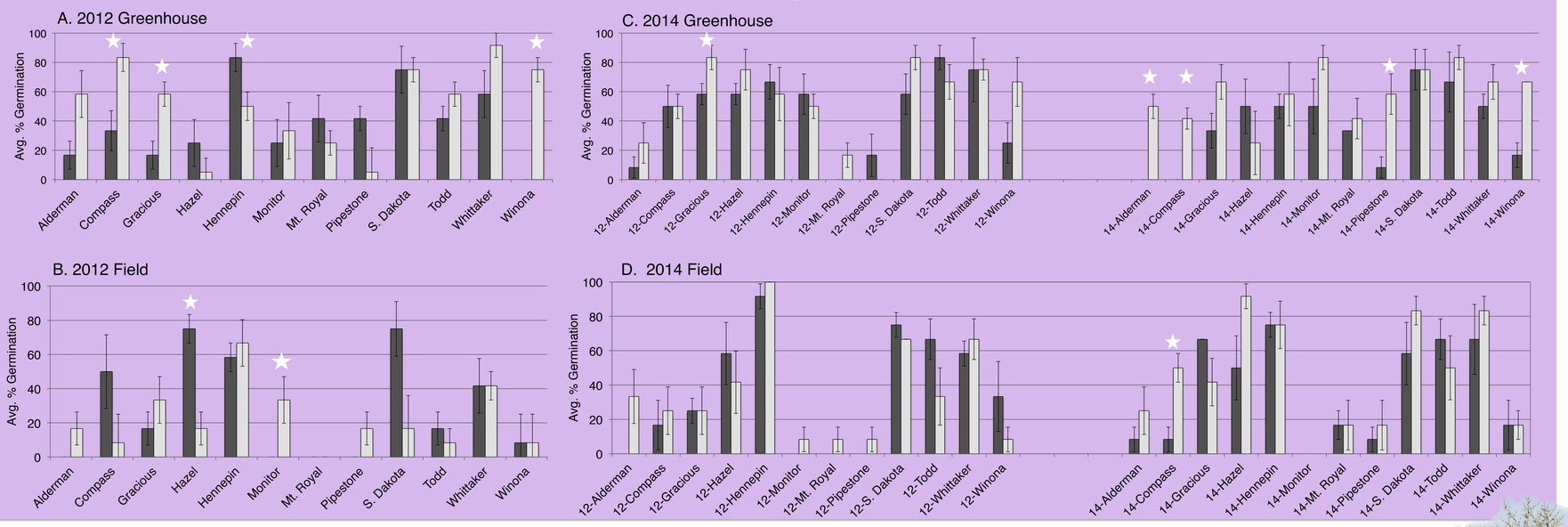
Figure 5: Average % germination for **plums** in 2012 & 2014.

Germination percentage varied among cultivars (Figs. 5 A-D).

In 2012, there were significant differences between the control and scarified seed germination percentages for 'Winona' in the greenhouse environment and for 'Hazel' in the field.

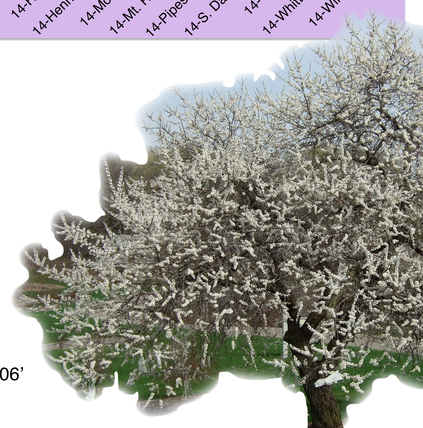
Scarified – significant differences ★ at p-value ≤ 0.10 for:
- Fig. 5A - 'Compass', 'Gracious', 'Hennepin' & 'Winona'
- Fig. 5B - 'Hazel' & 'Monitor'
- Fig. 5C - fresh seed 'Alderman', 'Compass', 'Pipestone', 'Winona'; stored seed 'Gracious'
- Fig. 5D - fresh seed 'Compass'

Storage - significant differences at p-value ≤ 0.10 for:
- Fig. 5C – 'Compass', 'Mount Royal' & 'Pipestone'
- Fig. 5D – 'Gracious' and 'Hennepin'



Discussion

- Among the fruit types, apricots had the highest germination percentage; tart cherries had the lowest; plums were highly variable.
- Differences in germination percentages for the field environments in both years could have been due to soil temperature, moisture, and/or snow cover.
- Across the species, scarification did not lead to an increase in seed germination in most cultivars.
- Stored seed had similar germination percentages in both environments across species except in a few cultivars.
- In the future, we will examine the effect of scarification on germination rate as well as the effect of seed viability and moisture content on germination.



P. armeniaca 'M106'