

Lesquerella ludoviciana Germination as Affected by Season of Development, Storage, and Afterripening

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Introduction

Lesquerella ludoviciana (silvery bladderpod) is a native plant that is endangered in Illinois which is at the eastern edge of its native range (Herkert, 1991). *Lesquerella ludoviciana* has spatulate leaves that form a basal rosette with typical Brassicaceae yellow flowers. The flowerstalk elongates during flowering. At present, the only place that it naturally occurs in Illinois is in a sand prairie on the Henry Allen Gleason Nature Preserve in Mason County.

Seeds do not require stratification or scarification in order to germinate, however preliminary observations indicate that they do not germinate to any satisfactory percentage until several months after harvest. In 2001 approximately 304 seeds were produced per plant, and in 2000 it was approximately 111 seeds per plant. This variation is an example of why multiple seasons of data and testing are needed to get an accurate reflection of the whole population. How long the seeds are viable is information needed to ascertain the seed bank available in the soil. Some plant's seeds have very short periods of viability while others last for years within the soil. The maturity of seed affected germination in 1999 (Coons, et al., 2000), although in 2000 no clear differences were found between seeds of different maturity (Beach, et al., 2001). Thus, more years of data are needed before determining an accurate representation of the effects of maturity and season on germination.

The environment can play a role in seed development and vigor. Annual rainfall, temperature, and sunny days can affect how and when seeds mature. Therefore seeds collected from more than one season are necessary to create an accurate picture of *Lesquerella ludoviciana* and its reproductive strategy. Knowledge of the plant's reproductive strategy is needed to make sound management decisions to maintain the plant in Illinois. This study was conducted to compare the germination of seed collected in 1999, 2000, and 2001.



North Bowl – Lower Colony

Objectives

The ultimate goal is to obtain an understanding of the reproductive strategy of *Lesquerella ludoviciana* to improve management decisions for its maintenance in Illinois.

The objectives were to compare:

- 1) Season effects
- 2) Storage effects
- 3) Afterripening effects

On the germination rates and percentages of *Lesquerella ludoviciana*.

Abstract

Lesquerella ludoviciana (Nutt.) S. Wats. (silvery bladderpod) is an endangered sand prairie plant in Illinois which is only known to occur in Mason County. Its seeds germinate easily. Several factors affect seed vigor of plants. First, environmental conditions coincident with the season of seed development affect vigor. Second, vigor of seed changes with storage. Some seeds have a short period of viability while others remain viable for many years. Third, afterripening can affect seed vigor. In preliminary observations, seed germination within the first several months after harvest was inhibited in this plant. Specific objectives of this study were to determine how season, storage, and afterripening affect seed vigor of silvery bladderpod. Seed was collected during early summer in 1999, 2000, and 2001. Each year seed was germinated on moistened filter paper in petri dishes at 25 C in continuous light. Remaining seed was stored at 4 C and less than 50% relative humidity. Seeds were germinated in the fall after collection, and again after each successive year of storage to estimate the roles of season of development and seed storage. Seeds collected in 2001 were germinated every few months to evaluate afterripening. Seeds collected in 1999 displayed no significant difference in germination after one or two years of storage, nor did seed collected in 2000 after one year of storage. This lack of difference indicates that seed does not lose its vigor after storage for one or two years. Determining season of development effects were difficult for 2001 because no seeds germinated from the first collection date. For the second collection date no significant differences were noted between the three seasons of development. Changes in germination indicate that afterripening was not a factor, and no major differences were noted due to season of development or storage.

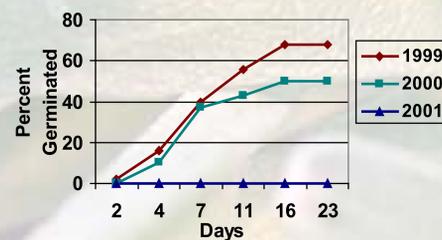
Procedure

Seeds of *Lesquerella ludoviciana* (Nutt.) S. Wats. (silvery bladderpod) were collected in the Henry Allen Gleason Nature Preserve in Mason County in Illinois where it exists in three distinct colonies: 1) North Bowl, lower colony, 2) North Bowl, upper colony, and 3) South Colony. For this study, seeds were collected from only the North Bowl, lower colony. Seed was collected on June 8 and 22, 1999; on June 1 and 16, 2000; and on May 14 and June 6, 2001. Seeds were stored at 4°C and 40-50% relative humidity until germination was tested. In 1999 the germination trials took place in April 2000. For 2000 and 2001 these trials occurred from October through November. In 2001 fifty seeds were germinated monthly after harvest (June, July, and September) with similar conditions to the main trials. These germination trials were conducted to test for afterripening effects. During the germination trials conducted in October of 2000, seeds from 1999 and 2000 were germinated. For the October 2001 trials, seeds from 1999, 2000, and 2001 were germinated.

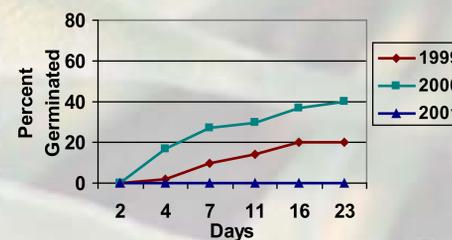
The seed collected was separated into groups by collection date and maturity. The flowerstalk elongates while flowering so the seed was divided into early maturing (lower half of the stalk) and late maturing (upper half of the stalk). Thus for each year, three groups of seed were collected (first harvest – early maturity, first harvest-late maturity, and second harvest). Fifty seeds from each group were germinated in five petri dishes. All seeds were dusted with Thiram (50% active ingredient, tetramethylthiuram disulfide) prior to use for fungal control. Petri dishes contained two sheets of filter paper and 5 ml of deionized water. They were germinated at 25°C in 24 hours of light at 4.5 μmoles/m²/sec. Number of seeds germinated was counted every 2-3 days. Germination was defined for this study as an evident radicle. Data were analyzed using analysis of variance. Microsoft Excel was used for statistics, and to determine means and standard deviations of each seed group.

Germination Rate of Seed Germinated in Year Harvested

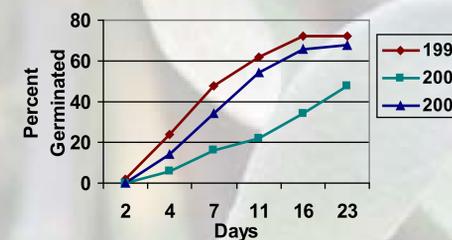
Germination Rate
First Harvest Early Seed



Germination Rate
First Harvest Late Seed



Germination Rate
Second Harvest



*For 2001 day 11 data actually were counted on day 9.

Percent Germination of 1999 Seed After Storage

	1999	2000	2001
First Harvest - Early	68 ± 3	58 ± 3	60 ± 7
First Harvest - Late	20 ± 3	26 ± 6	12 ± 4
Second Harvest	72 ± 2	74 ± 6	80 ± 4

Percent Germination of 2000 Seed After Storage

	2000	2001
First Harvest - Early	52 ± 2	26 ± 1
First Harvest - Late	26 ± 1	40 ± 1
Second Harvest	38 ± 2	32 ± 2

Overall no major decreases in germination were observed due to storage.

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A *Lesquerella* flower



A *Lesquerella* plant in flower in a University of Illinois greenhouse

Percent Germination of Seed Germinated in the Year Harvested

	1999	2000	2001
First Harvest - Early	68 ± 3	52 ± 6	0 ± 0
First Harvest - Late	20 ± 3	38 ± 2	0 ± 0
Second Harvest	72 ± 2	48 ± 3	68 ± 2

No germination was recorded for seed from the first harvest in 2001. The first harvest displays a difference between the 1999 and 2000 seed in both maturities. For the second harvest 2000 seed displays a difference from the 1999 and 2001 seed. This response also is shown in the figures below.

Summary

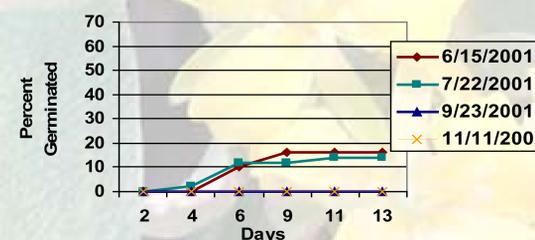
- Seasonal differences in germination were observed.
- Overall no major decreases in germination were observed due to storage.
- Afterripening trials for germination were inconclusive due to immature seed at the early harvest.



A *Lesquerella* plant in its native habitat

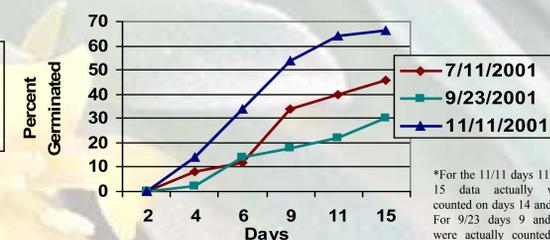
Germination Rate of Afterripening Trials

Germination Rate
5/14/01 Harvest



Germination dropped to 0 after the 7/22 trial.

Germination Rate
6/6/01 Harvest



Germination decreased between the 7/11 and 9/23 trials but increased again between the 9/23 and 11/11 trials.

*For the 11/11 days 11 and 15 data actually were counted on days 14 and 16. For 9/23 days 9 and 11 were actually counted on days 10 and 12.

Literature Cited

- Coons, J.M., H.R. Owen, J.L. Franklin, and J.E. Ebinger. 2000. Reproductive potential of silvery bladderpod (*Lesquerella ludoviciana*). American Journal of Botany. 87(6): 41.
- Beach, S.E., J.M. Coons, H.R. Owen, B.L. Todd, and M.A.L. Smith. 2001. Germination of *Lesquerella ludoviciana* as affected by seed age. Trans. Ill. State Acad. Sci. 94:82.
- Herkert, J.R. (ed.) 1991. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 1-Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 158 p.