Seed Longevity of *Lesquerella ludoviciana*, an Endangered Species of the Illinois Sand Prairies

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L. ludoviciana flowers

ABSTRACT

*Lesquerella ludoviciana (*Nutt) S. Wats. (silvery bladderpod) is an endangered species of Illinois sand prairies. The only naturally occurring Illinois population is in Mason County. Numerous vigorous seeds are produced on elongating stalks. Seeds mature first on lower portions of stalks, and maturity affects germination. Few viable seeds were found in soil cores. Our objective was to determine how seed longevity in silvery bladderpod affects ability of seeds to germinate and to establish vigorous plants. Seeds of *L. ludoviciana* were collected in 1999, 2000, 2001, and 2002 from Mason County, and stored at 4ºC until 2006. Germination was tested with seed lots from upper and lower portions of stalks and from different harvests each year. Four replications of 50 seeds were germinated in petri dishes with filter paper at 25°C with continuous light. Germinated and contaminated seeds were counted for 4 weeks. Emergence was tested using one seed lot for each year. Three replications of 25 seeds were planted using soilless mix at 26ºC with 16 hrs light. Emerged seedlings were counted for 4 weeks. Width of rosettes and number of leaves were measured weekly. Fresh and dry weights were taken at the end. For seeds from 1999 and 2000, germination was significantly lower for first harvests (26-43%) than for second harvests (66-78%), which was similar to 2001 seed (68-76%). For 2002, germination was 44%, being similar to first harvests in 1999 and 2000, possibly because seed from entire stalks were mixed and contained more immature seed. Emergence was significantly different in 1999, 2000, 2001 and 2002, being 86, 63, 57 and 19%, respectively. Seedlings from different years had significantly different widths and weights, but similar leaf numbers. Several factors affected germination and seedling development including years in storage, harvest date and seed maturity.

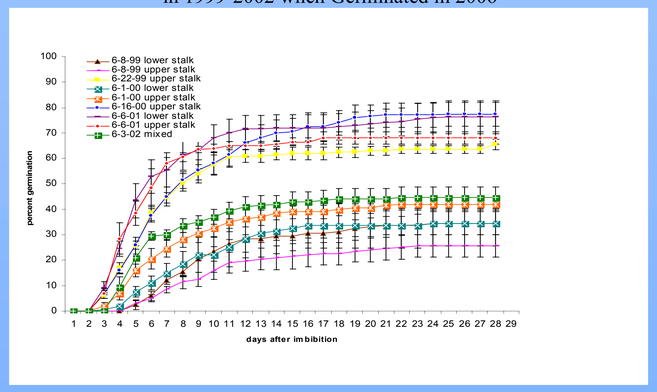
INTRODUCTION

*Lesquerella ludoviciana (*Nutt) S. Wats., (silvery bladderpod) is an endangered species of Illinois sand prairies where only found at the Henry Allan Gleason Nature Preserve in Mason County (Herkert and Ebinger, 2002). Several factors can affect germination and emergence of *L. ludoviciana* including maturity of seed, environment, and seed age or longevity in storage. In the early part of the growing season, seed from the lower portion of the flower stalk is mature while seed on the upper portion is not mature. Later in the growing season, seeds from the entire stalk are mature (Claerbout, 2003). The environment including annual rainfall, temperature, and sunny days can affect seed development and vigor (Beach, *et al.,* 2002). Because of these factors, seeds collected from more than one season and from different harvests are important when studying seeds of *L. ludoviciana.* More understanding of the seed biology of this species is important for its survival and to make good management decisions to maintain this species in Illinois. *L. ludoviciana* produced an estimated 1,200,000 seeds, with high germination at the Nature Preserve in 1999 (Coons, *et al.,* 2000). However, not many seeds remain in the seed bank (Claerbout, 2003). It is unclear whether this absence from the seed bank is due to short seed longevity or predation or other factors. It is not known how long seeds will remain viable in storage. By determining how seed age affects viability and vigor, we will b e able to predict whether establishment of new plants is limited by the short life of seeds. Objectives of this study are to compare how seed storage affects the ability of *L. ludoviciana* to germinate and establish vigorous plants, including seed collecte d on different dates (early maturity vs. late maturity) within the same year and in different years.

L. ludoviciana in May at the Henry Allan Gleason Nature Preserve

RESULTS

Cumulative Germination (mean ± SE) for Seed Lots Harvested in 1999-2002 when Germinated in 2006



Germination, Contamination and Tetrazolium Tests for Seed Lots Harvested 1999-2002 when Germinated in 2006

Seed lots	Germination (%)	Contaminated (%)	pink TZ test (%)
6-8-99 lower stalk	34.5±4.6 bc	0.0±0.0 a	20±8.2 bc
6-8-99 upper stalk	25.5±4.4 c	0.0±0.0 a	10±10 c
6-22-99 upper stalk	65.5±2.1 a	0.5±0.5 a	70±5.8 a
6-1-00 lower stalk	34.5±8.8 bc	0.0±0.0 a	10±10 c
6-1-00 upper stalk	42.0±2.3 b	0.0±0.0 a	30±5.8 bc
6-16-00upper stalk	77.5±4.6 a	0.5±0.5 a	40±14.1 b
6-6-01 lower stalk	76.3±6.4 a	0.0±0.0 a	10±5.8 c
6-6-01 upper stalk	68.0±2.4 a	0.5±0.5 a	20±8.2 bc
6-3-02 mixed	44.5±4.3 b	2.0±2.0 a	5±5 c

z means within a column followed by different letters are significantly different based on Duncan's Multiple Range Test at the 5% level.

SUMMARY

Germination

? 1999 and 2000 seed germination was significantly higher when harvested in late June than in early June.

? 2001 seed germination when harvested in early June was similar to late June seed from 1999-2000.

? 2002 seed germination was low because seed from the entire stalk was mixed and contained both mature and immature seed.

Emergence

? Initial maturity of seed was more important than longevity based on emergence and growth.

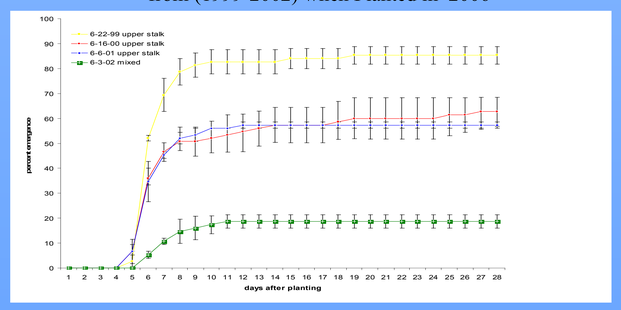
Importance

Seed was still vigorous after 3.5-7.5 years in storage as long as it was mature when collected. This information can be very useful in restoration and land management efforts if stored *L. ludoviciana* seed is used for reestablishment of plants.

MATERIALS AND METHODS

- *L. ludoviciana* seeds were collected in 1999-2002, from the Henry Allan Gleason Nature Preserve and stored in a desiccator at 4 °C with 40-50% relative humidity.
- Germination test included seed lots from both upper and lower stalk and from different harvests each year. Four repetitions of 50 seeds each per seed lot were placed into petri dishes containing filter paper, moistened with 5 ml water. Seeds were dusted with a fungicide. Petri dishes were sealed with parafilm, and placed in a Rubbermaid® tub in a germinator at 25°C with constant light (17 µmol/m2/sec). Germinated or contaminated seeds were counted for 28 days.
- Five ungerminated seeds from each petri dish were tested with tetrazolium. Seeds were placed in separate petri dishes on moistened filter paper, cut, dripped with 0.5% 2,3,5-triphenyl tetrazolium chloride, kept in the dark at 25°C, and observed for a pink color change for 24 hours.
- Emergence test included one seed lot from each year (June 22, 1999 upper stalk, June 16, 2000 upper stalk, June 6, 2001 upper stalk and June 3, 2002 mixed). Three repetitions with 25 seeds for each seed lot were planted in trays containing soilless mix which was kept moist in a growth chamber at 25.9ºC with16 hrs of light at 309 µmol/m²/sec. Emerged plants were counted for 4 weeks. Leaf numbers and plant width were measured weekly. Fresh and dry weights were taken when plants were harvested.
- Average and standard errors were calculated. Univariate tests followed by mean separations using Duncan's multiple range tests were done using SPSS.

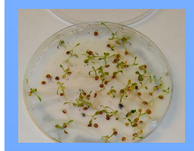
Cumulative Emergence (mean ±SE) for Seed Lots from (1999-2002) when Planted in 2006



Emergence, width of rosettes, number of leaves and weights for plants from seed lots (1999-2002) planted in 2006

Seed Lots	Emergence (%)	Width (cm)	Leaf (#)	Fresh weight (g)	Dry weight (g)
6-22-99 upper stalk	85.5±3.5 a	3.3±0.2 a	5.8±0.2 a	0.86±0.034 a	0.148±0.009 a
6-16-00 upper stalk	62.7±5.8 b	3.3±0.3 a	5.5±0.3 a	0.52±0.030 b	0.093±0.004 b
6-6-01 upper stalk	57.3±1.3 b	2.7±0.3 b	5.4±0.3 a	0.43±0.036 b	0.071±0.007 c
6-3-02 mixed stalk	18.7±2.7 c	2.1±0.3 c	5.5±0.3 a	0.10±0.013 c	0.013±0.002 d

z means within a column followed by different letters are significantly different based on Duncan's Multiple Range Test at the 5% level.



Germination trial

Emergence trial

ACKNOWLEDGEMENTS

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