Germination Rates and Viability for *Liatris* Species

Theodore Brancheau

Abstract

The rate of species extinction has risen exponentially in recent memory. In order to combat the possibility of certain plant species from going extinct, the maintenance of healthy seed banks is critical to the future survival of certain species. However, seeds can only survive being frozen for so long. In order to test to see if the stored seeds of certain species need replaced, it is important to conduct viability and germination studies on stored seeds. This experiment's purpose is to determine whether or not the stored samples of *Liatris squarrosa*, *Liatris bracteata*, *Liatris cymosa*, and *Liatris tenuis* are still viable. These species are important because they are all flowering plants and important to the survival of bee populations, which are critical to the entire ecosystem.

Introduction

The species *Liatris bracteata* and *Liatris squarrosa* both have widespread ranges throughout the United States of America, so they are neither endangered or at risk of becoming endangered. Both *Liatris cymosa* and *Liatris tenuis* have much smaller ranges, limited to either Texas or Louisiana, so although they are not currently endangered, they are more at risk than the other species. Despite the fact that they are not endangered, it is important to note that just because a species is not endangered overall, particular populations within specific regions are very susceptible to being wiped out. It remains important to conserve these species, in case the populations in Texas, and in specific counties, become threatened. In addition, it is better to keep healthy seed bank populations of species before the species become threatened. Based on the background research, the experiment is likely to find that; If the four different species of *Liatris* are tested for germination and viability, then only *Liatris bracteata* and *Liatris cymosa* will be viable and experience high germination rates because the *Liatris squarrosa* seeds are too old and the original sampling size of *Liatris tenuis* was simply too small to get a healthy variation of viable and nonviable seeds while the sampling sizes of *Liatris bracteata* and *Liatris cymosa* were larger and were stored more recently. The null hypotheses is that if the four different species of *Liatris* are tested for germination and viability, there will be no difference between the germination rates of the four species.

Conclusions

Between all of the species tested, *Liatris bracteata* had the highest rates of germination, *Liatris cymosa* had the second most, *Liatris tenuis* had the third most, and *Liatris squarrosa* exhibited no germination at all. Since the rate of germination for *Liatris bracteata* was the highest of any of the species, that prediction was accurate. However, the hypothesis that *Liatris tenuis* would do better than *Liatris cymosa* was incorrect. The outlier, *Liatris squarrosa*, witnessed no germination, which was expected. The null hypothesis must therefore be rejected, because there were differences between the species. Further research ought to be done into *Liatris tenuis* and *Liatris squarrosa* to see if the seeds are simply dormant and not unviable.

Materials and Methods

The experiment was run under a single design with four separate trials, one for each species of *Liatris*. In each trial a clear plastic container was prepared by labeling it with the seeds information and by placing moist blotter paper into the container. The seeds were removed from the freezer and separated into testing samples of 25 seeds each. There were 25 seeds of *Liatris squarrosa*, 25 seeds of *Liatris bracteata*, 25 seeds of *Liatris cymosa*, and 25 seeds of *Liatris tenuis*. These seeds were then brought to room temperate and dehydrated in a desiccator for 24 hours. After the seeds were prepared the seeds from each species were put into their respective containers onto the moist blotter paper in an even 5 by 5 spread. The containers were then placed into the germinator which was set to have 2 separate cycles. Cycle one was 8 hours long at 30 degrees Celsius with the light on. Cycle two was 16 hours long at 20 degrees Celsius with the light off. No control was needed for this experiment.

Figure 1. *Liatris bracteata*

Figure 2. *Liatris tenuis*

Figure 3. Liatris cymosa

Figure 4. *Liatris squarrosa*

Results

The germination of the seeds was monitored usually twice a week and the seeds that germinated were recorded. When the seeds that germinated were calculated as a percentage of the total seeds tested, as represented in figure one, the *Liatris squarrosa* seeds had 0%, *Liatris cymosa* had 20%, *Liatris bracteata* had 68%, and *Liatris tenuis* had 4% of the plants germinate. The percent of total germination represented by day is shown in Figure 5. Figures 7 and 8 display how the seed trays looked at the end of the experiment. Figure 7 shows the extensive fungal growth that appeared on the plants, which can alter the results in a longer experiment.

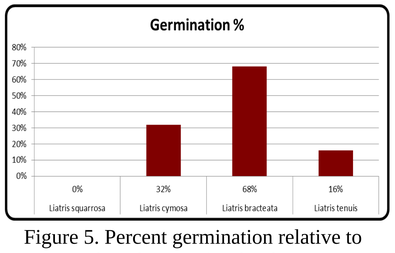

Figure 5. Percent germination relative to the other species, by day

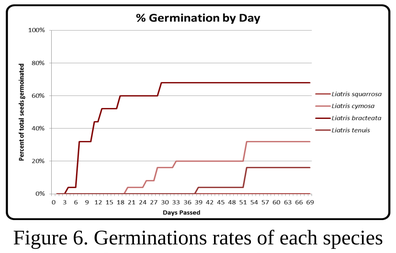

Figure 6. Germinations rates of each species presented as percentages relative to each other

Figure 7. End germination for *Liatris tenuis* and *Liatris bracteata*

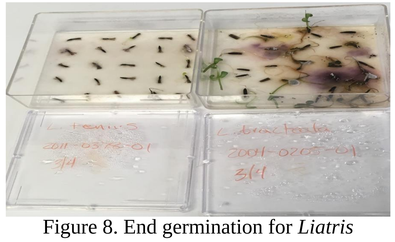

Figure 8. End germination for *Liatris cymosa* and *Liatris squarrosa*

Images Used

Figure 1. *Liatris* bracteata. Bill Carr. *Liatris* bracteata [photograph]. retrieved from https://www.wildflower.org/plants/result.php?id_plant=LIBR

Figure 2. *Liatris* tenuis. Jane Villa-Lobos, hosted by the USDA-NRCS Plants Database

Figure 3. *Liatris* cymosa. [photograph of *Liatris* cymosa]. Retrieved from http://www.floristtaxonomy.com/category/autumn-flowers/page/11

Figure 4. *Liatris* squarrosa. Alan Cressler. 2010. *Liatris* squarrosa [photograph]. Retrieved from http://wildflower.org/gallery/result.php?id_image=45891

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Special Thanks

Dr. Betsy Morgan- Professor at Lone Star College Kingwood

Ellen Strupp – Botanist at Mercer Botanical Gardens