UC Santa Barbara
Reports

Title
Lupinus nipomensis Second Season Seed Bulking Report, 2013 – 2014

Permalink
https://escholarship.org/uc/item/3685d9wk

Author
Chapman, Wayne

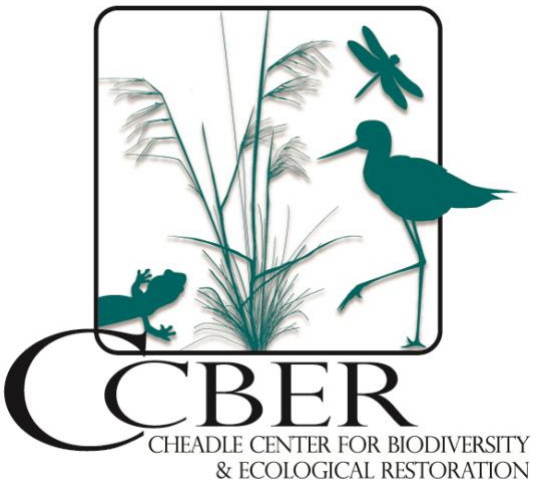
Publication Date
2014-10-01

Data Availability
The data associated with this publication are available upon request.

Copyright Information
This work is made available under the terms of a Creative Commons Attribution-NonCommercial License, availalbe at https://creativecommons.org/licenses/by-nc/4.0/

eScholarship.org Powered by the California Digital Library
University of California

UC SANTA BARBARA



Lupinus nipomensis Second Season Seed Bulking Report, 2013 – 2014

October 15, 2014

Wayne Chapman *North Parcel and Greenhouse Manager*

Nipomo Lupine Report 2013-2014 Second Season
USFWS Annual Report, October 15, 2014
By: Wayne Chapman, CCBER

Although horticultural questions remain, CCBER's second attempt at bulking out seed of *Lupinus nipomensis* yielded better success than our previous attempt. This season's results surpassed last season with great improvements in soils, plant survival, plant vigor, and most importantly, seed set. Still unresolved is the question of how to more consistently germinate older seed, although we had some success with seed from 2007 in our first sowing. Despite this continuing question, CCBER used 300 seeds to germinate 118 plants, 105 of which survived to produce 8658 seeds. The average number per plant was 82.5 seeds and the most prolific plant produced 244 seeds. Our trials have also left a few untested methods that may yet be of interest. Throughout the trial CCBER gleaned more valuable insights into the species biology. See photos in attached document.

Sowings, Soils and Treatments

Last year, CCBER recognized that any amount of compost or organics in the soils was detrimental to the health of *L. nipomensis*. Due to this, CCBER imported native sand from the Nipomo dunes and made this the basis of, instead of mere inoculum, the soils used. Since pure beach sand tends to perform poorly with respect to drainage in one-gallon containers, the sand was blended with one of three amendments. Soils used in each were one of these three mixes. All were 50% native sand from various locations on site mixed with either 50% perlite, 50% sunshine #5 organic plug mix, or sunshine #5 and perlite combined at 25% each. All mixes seemed suitable and the plants thrived in each equally showing no measurable differences between them. All seed was scarified before being soaked in clean, filtered warm water. Seed from the third and final sowing on **3/13/14** were soaked in water mixed with the native sand. Two of the four treatments from **3/13/14** were heated and smoked with fire. All seed was planted individually, by hand, approximately 1/8" deep in one-gallon containers. Most were planted with 2 seeds per container.

The three individual sowings CCBER performed consisted of the following:

First sowing: Dec 18, 2013

-60 seeds 2007-359
-60 seeds 2012 not accessioned "B"
Seed scarified with 400 grit sandpaper Dec 17, 2013, individually, by hand, by pressing seed on sandpaper and dragging approximately 10 cm (this method was consistent with the scarification in all treatments). Seed then soaked in warm water for approx. 12-15 hours and planted Dec. 18, 2013.

This sowing produced 27 individuals, mostly from 2012 stock, 6 from 2007. Individual health was good and most produced healthy crops of seed.

Second sowing Jan 28 2014
-60 seeds 2012-NA "B"
-60 seeds 2013 CCBER
Seed scarified, soaked for approximately 28 hours in initially warm water.

This sowing produced 68 plants and was our best. These individuals were very robust and produced the majority of our seed.

Third sowing March 13 2014
-15 seeds 2012 Not Accessioned "A"
-15 seeds 2013 CCBER, UCSB
-15 2004-194
-15 2007-359

A)
Seed scarified, soaked in sand/water "broth"
(15 from 2012 Not Accessioned "A", and 15 from 2007 359)

B)
Seed scarified, then held momentarily over fire for heat/smoke treatment for +/- 45 seconds. Seed then soaked in sand/water "broth".
(15 from 2013 CCBER, and 15 from 2004-194)

This sowing proved heat/smoke treatment to be ineffective/detrimental for *L. nipomensis,* as even seed from 2013 did not germinate after heat. The older seed in both treatments yielded zero germination. The 2012 seed did very well.

Plant Numbering and Monitoring
All plants were numbered in the order they germinated. Seed was collected daily, with number of flowers and seed produced recorded for each. A few did not survive to flower or seed. One complication was the use of small wooden stakes for plant numbering. Although UV resistant ink was used, some of the wood stakes deteriorated much more quickly than most, making the numbers difficult to discern.

Seed Germination and Growth
Approximately 39% of the seed we used germinated. A few seedlings were non vigorous or had malformations, but the vast majority grew into healthy plants. Seedlings generally emerged about 10 -14 days after sowing, with a few showing delayed germination of several weeks or even months. Growth was robust, free from disease and produced many large, branching plants despite their being grown in very low-nutrient soils, with no fertilizer added (occasional jackrabbit manure was the only apparent nutrition observed in the sand). Due to the poor results with

compost in soils, a mild conventional fertilizer solution either watered in or applied as a foliar feed may boost plant growth and seed set substantially.

Seed Dispersal and Collection

Due to the unanticipated vigor of these plants in contrast with the previous attempt, CCBER learned that the drying pods of healthy *Lupinus nipomensis* are capable of discharging seed a considerable distance; up to 48 inches at least. Because of this we began to see what appeared to be second-generation germination in some cases from seed discharged earlier the same season. Therefore it was sometimes difficult to distinguish between seed germinating that was discharged into the pots from the current year's crop and delayed germination of originally sown seed (which was sometimes observed). Most likely some seed was also lost out of the caged enclosure. In addition, although a great number of seeds were collected as the pods were ripening, many ripened seeds were collected off of the floor of the enclosure. These were generally attributed to the plants nearest them, although each and every seed collected could not be attributed to its parent plant with total certainty. This presents a dilemma if we are to keep seed contained to the confines of the growing space of each plant. This would require individual cages with sides and a top around each plant, which would potentially affect growth space and light, as well as add to the difficulty of monitoring the plants. Nevertheless, we hope that the quantity of seed we collected is of some future importance to the species. 230 seeds were collected that could not be attributed positively to a particular plant, and were placed in an envelope labeled "random".

Observations

Correlation Between Imbibing and Germination

After scarification and soaking for 12-24 hours, many seeds imbibed and swelled to approximately double their normal size. Although imbibing is generally considered a precursor to germination, this did not seem to necessarily be the case here. Curiously, the first treatment done with 2007 and 2013 seed yielded notably better imbibing for the 2007 group, but poorer germination. The 2013 group on the same treatment imbibed more poorly, but germinated more vigorously.

Treatment Observations

Currently the best treatment may be scarification followed by soaking in water/native sand "broth" (water that contains some site-gathered dune sand or sand leachate) although soaking in clean water also yielded up to 64% germination. Fire and smoke seemed to be a poor treatment for *L. nipomensis,* giving us the lowest germination rates of essentially zero. The fire treatment was done thinking these might have adapted to grassland burning, with the idea in mind that the plants may not be best adapted to true dunes, but rather to more loamy soils now in cultivation, but exist on the fringe of their remaining habitat. The poor germination response to fire enforces the idea that this is a truly a dune species, where the general lack of vegetation makes fire history infrequent, and no evolutionary relationship with fire exists. The difficulties with warm weather in their vegetative

state hints to a cool-weather loving species, indicating a possible treatment for the reticent older seeds could be a cold stratification of 1-3 months.

Aversion to Warm Weather

During the heat waves of May, 2014, temperatures reached almost 100 F at our nursery. Plants were observed "shriveling" in the heat with leaves yellowing somewhat and curling upwards. All plants were thereafter provided shade to assist with heat stress; full sun was assumed to be ideal otherwise. The affected portions of the plants displayed yellowed, upturned leaves that did not fully recover; subsequent new growth on affected plants seemed to return to normal. Numerous pods aborted their seed or produced nonviable seed during these hot-weather episodes. It therefore appears that the species may be inclined towards cooler temperature preferences that may translate into germination preferences for cooler temperatures, or a cold stratification. This needs further investigation.

Due to the aforementioned factors with seed dispersal, numbers are approximate.

Sowing (Date)	**Seed Used**	**Seed Collected**
1st) Dec 18	120	885
2nd) Jan 28	120	6596
3rd) Mar 13	60	947
Random (questionable source)		230

Sowing/Treatment	**Year Collected**	**% Germination**
1st) Scarification, soak in clean warm water	2007 2012	**11%** **32%**
2nd) Scarification, soak in warm water	2012/2013	**64%**

3rd) Scarification, fire/smoke, soak in native sand "broth"	2007 2013	**0%** **0%**
Scarification, soak in native sand "broth"	2004 2012	**0%** **100%**