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The Western Red Lily Centennial Project©

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INTRODUCTION

The western red lily (*Lilium philadelphicum* var. *andinum*) is the floral emblem of the province of Saskatchewan, Canada. This showy lily is protected under the Provincial Emblems and Honours Act, but its numbers continue to decline due to anthropogenic activities such as cultivation and fire suppression (Government of Saskatchewan, 1988). The SaskPower Shand Greenhouse undertook the task of propagating large quantities of the western red lily as part of the province's centennial celebration in 2005. Several research trials were initiated in order to determine appropriate propagation methods along with techniques for accelerating growth and blooming.

TRIALS AND RESULTS

Germination trials were set up to determine the effects of seed source, seed pretreatments, stratification temperatures, moisture levels during stratification, and light exposure on the germination of western red lily seed. Results were analysed using an ANOVA F-test. It was found that pre-soaking and cold stratification had the most significant effect on germination. A 3-day soak in room temperature water with 5 daily water changes followed by a 30-day cold stratification at 5 ºC (41 ^{0} F) gave the highest levels of germination. Seed was sown with a light covering of medium.

Once seed germination procedures were established, a trial was performed to determine the effectiveness of tissue culture propagation in comparison to seed propagation. Western red lily tissue culture bulblets were produced at the University of Saskatchewan using standard tissue culture techniques. In our growing conditions, seed-propagated plants showed greater growth, more robust plants, more vegetative stalks, and greater survival and blooming after outplanting.

Table 1. Treatments involved in one forcing cycle.

Phase	Location	Photoperiod (h)	Media Temperature (ºC/ ºF)	Time (days)
Growth	Greenhouse	18	18-20 / 64-68	77
Pre-cooler conditioning	Walk-in cooler	8	7-10 / 45-50	28
Cooler	Walk-in cooler	0	2-5 / 36-41	63
Post-cooler conditioning	Walk-in cooler	8	7-10 / 45-50	14

One of the main goals of this study was to speed both growth and blooming in western red lily. This was done using artificially accelerated growth cycles. Each trial started with a 14-day germination and establishment period. The plants were

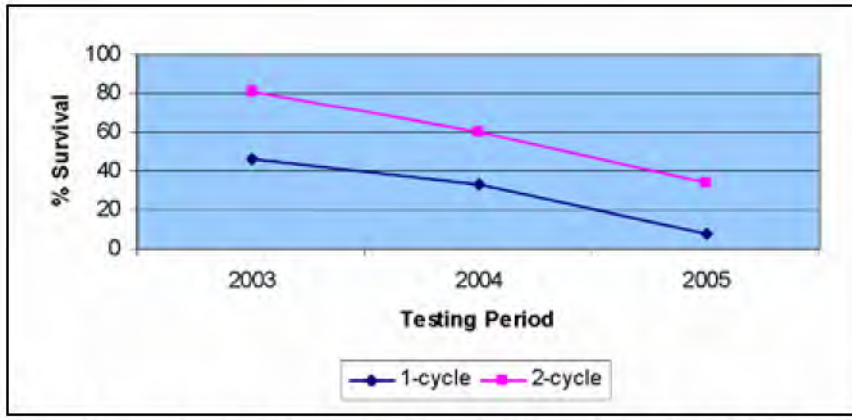

Figure 1. Percent survival of one and two forcing cycles based on number of visible plants.

then exposed to 1, 2, or 3 accelerated growth cycles. Each cycle was 182 days long and involved growth, pre-cooler conditioning, cooler, and post-cooler conditioning phases (Table 1). The best results occurred after two accelerated growth cycles. Larger-celled trays resulted in larger, more robust plants.

Many gardeners have encountered difficulties establishing western red lilies in cultivated soil. We hypothesized that the lack of natural fungal associations was limiting long-term survival. We chose to inoculate half of our plants with the vesicular-arbuscular mychorriza *Glomus intraradices* because it is commonly found in Saskatchewan soils and has been used successfully in the growth of commercial bulb crops like garlic. Root staining prior to outplanting showed hyphal growth, but no vesicle or arbuscule development. The luxury environment of the greenhouse may have limited the necessity for fungal development. In the first 2 years after outplanting, no obvious survival or performance differences were noted between the inoculated and non-inoculated plants. Mychorrizae will be more likely to play a role in long-term survival.

Samples of each trial were outplanted into 5 different locations. The biggest challenges to lily survival observed were inadequate moisture, wildlife predation, and competition from taller, more "weedy" plants. The most successful plots received regular watering and weeding. A cage made of hardware cloth was successful in excluding wildlife in one site.

In the wild, a lily grown from seed takes 3–4 seasons to bloom (Lawrence 1995–1996). In our trials blooms were seen only one season after outplanting. Blooms were most common in the two accelerated growth cycle lilies that were grown from seed. There were significant winter losses in all trials, but those plants that did survive tended to spread and produce more plant stalks (Fig. 1). Determining survival in this species can be difficult because the bulbs are able to remain dormant for one or more seasons at a time.

We propagated over 81,000 western red lilies for distribution in summer 2005. These lilies were grown from seed, given two accelerated growth cycles and inoculated with *Glomus intraradices*. In spring 2006 we had reports of beautiful blooming lilies in gardens across the province. We hope that additional trials will be able to determine the long-term effectiveness of mychorrizal inoculation in western red lily. With any luck these centennial lilies will continue as a symbol of Saskatchewan for generations to come.

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