



Development of the Endangered Kankakee Mallow (*Iliamna remota*, Greene) When Affected By Light Intensity



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ABSTRACT

Iliamna remota Greene (Malvaceae), Kankakee mallow, is an endangered species in Illinois. In 1984, it was on the verge of extinction when a recovery plan began to eradicate invasive woody shrubs, mainly *Lonicera maackii* (Amur honeysuckle). These shrubs compete with native species partly by shading. Recent lack of management is threatening the *I. remota* population. Our objective was to simulate shade from *in situ* canopy on development of *I. remota*. Seeds were germinated in vermiculite, and seedlings were transplanted into a hydroponic system in two growth chambers with a 16h/8h (light/dark) photoperiod at 25°C. Light intensity was either 248 ± 13 µmol/m²/sec (high light) or 63 ± 6 µmol/m²/sec (low light). Development was quantified by measuring number of leaves, fresh and dry weight, shoot height, leaf area, root length, and root volume. After 3 weeks, plants grown with high light were more developed with more leaves on both main stems and side branches, taller shoots, greater leaf area, greater root volume, longer roots, and greater fresh and dry weights of shoots and roots, than those with low light. Thus, light intensity greatly affected the development of *I. remota*, stressing the importance for management to control shrubs to preserve *I. remota*.

INTRODUCTION

Iliamna remota Greene (Malvaceae), Kankakee mallow, is a state endangered plant that is endemic to Langham Island in the Kankakee River in Kankakee County, Illinois (Herkert and Ebinger, 2002). In 1983, *L. maackii* (Rupr.) Maxim and *Rosa multiflora* Thunb, both woody, invasive shrubs, were out competing *I. remota*, resulting in declines in the population size (Schwegman, 1984). Under a canopy of these woody plants light availability is limited for lower growing plants. In most plant species, variations in light intensity have morphological and physiological effects (Rice and Bazzaz, 1989). For many native species, limited light availability decreased population sizes even to extinction. In previous studies, removal of dense thickets of *Lonicera maackii* increased diversity and the numbers for individuals of each native species (McDonnell *et al.* 2005). *I. remota* grows mostly in “full sun” or “open areas” and typically is intolerant of dense shade and shrub competition (Glass *et al.*, 2003; Schwegman, 1984). Information regarding growth of *I. remota* with low light would be useful for management plans with the goal of preserving the *I. remota* population on Langham Island.



Plants in low vs. high light after 3 weeks

MATERIALS AND METHODS

- ◆ Kankakee mallow (*Iliamna remota* Greene) seeds were purchased from Prairie Moon Nursery.
- ◆ Seeds were dipped in 80°C water for 20 seconds to break dormancy.
- ◆ Seeds were grown in vermiculite until 2-4 true leaves developed.
- ◆ Seedlings were transplanted into a hydroponic system.
- ◆ Hydroponic system consisted of aeration tubing hooked to an Aquarium pump inserted into plastic containers (2.2 liters) with a nutrient solution.
- ◆ Nine seedlings were placed in each of two Conviron® growth chambers at 25°C with 16h light/8h dark, and a light intensity of 248 ± 13 µmol/m²/sec (high light) or of 63 ± 6 µmol/m²/sec (low light).
- ◆ Development was quantified by measuring number of leaves, fresh and dry weights, shoot height, leaf area, root length, and root volume.
- ◆ Data were analyzed using one-way analysis of variance.

The objective of this study was to quantify effects of light intensity on growth of *I. remota* seedlings to simulate canopy shade.

RESULTS

Growth parameters at two light intensities after 3 weeks.

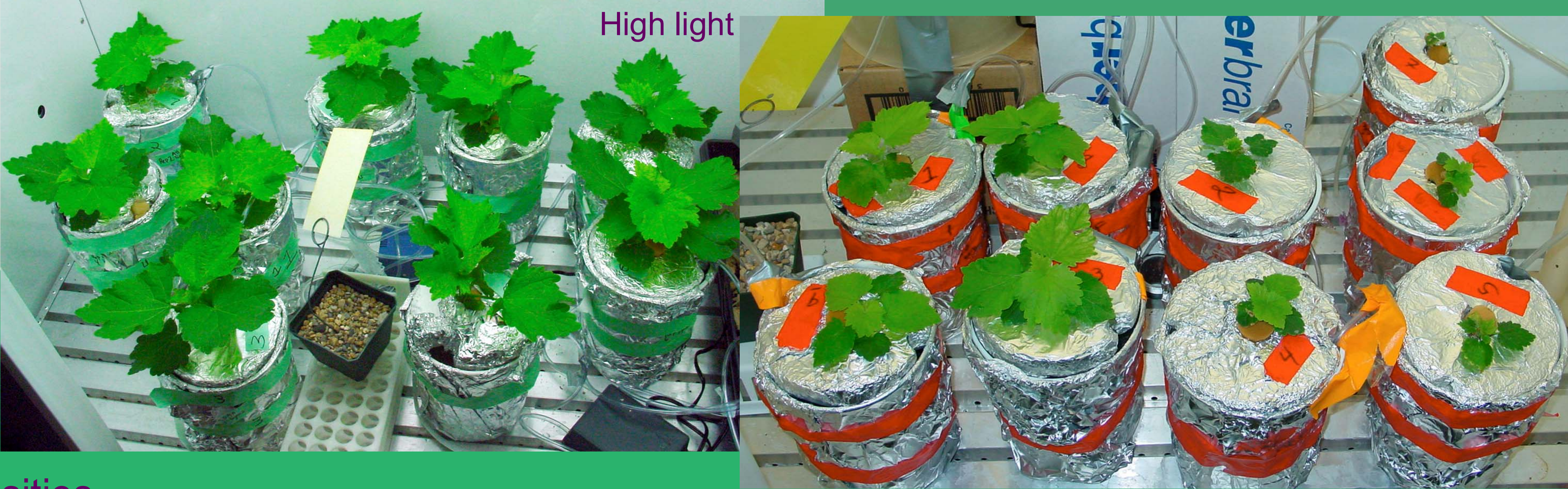
SHOOT				
LIGHT	Main leaves	Side leaves	Height (cm)	
High	13.0±2.4a ^{zy}	2.6±1.1a	6.0±0.5a	
Low	9.0±1.7b	0.8±1.5b	2.2±0.9b	
	Fresh Weight (g)	Dry Weight (g)	Leaf Area (cm ²)	
High	11.2±1.7a	1.5±0.2a	297.5±50.9a	
Low	1.4±0.7b	0.2±0.1b	59.7±34.3b	
ROOT				
	Length (cm)	Fresh Weight (g)	Dry Weights (g)	Volume (mL)
High	46.7±7.8a	11.70±2.50a	0.60±0.10a	11.6±2.6a
Low	23.7±11.4b	0.96±0.30b	0.04±0.00b	0.9±0.6b
SHOOT TO ROOT RATIO				
	Fresh Weight Ratio		Dry Weight Ratio	
High	0.9±0.2b		2.4±0.4a	
Low	1.8±0.4a		5.1±2.1a	

^z means within a parameter followed by different letters are significantly different at p=0.05 level.
^y means ± standard deviation.

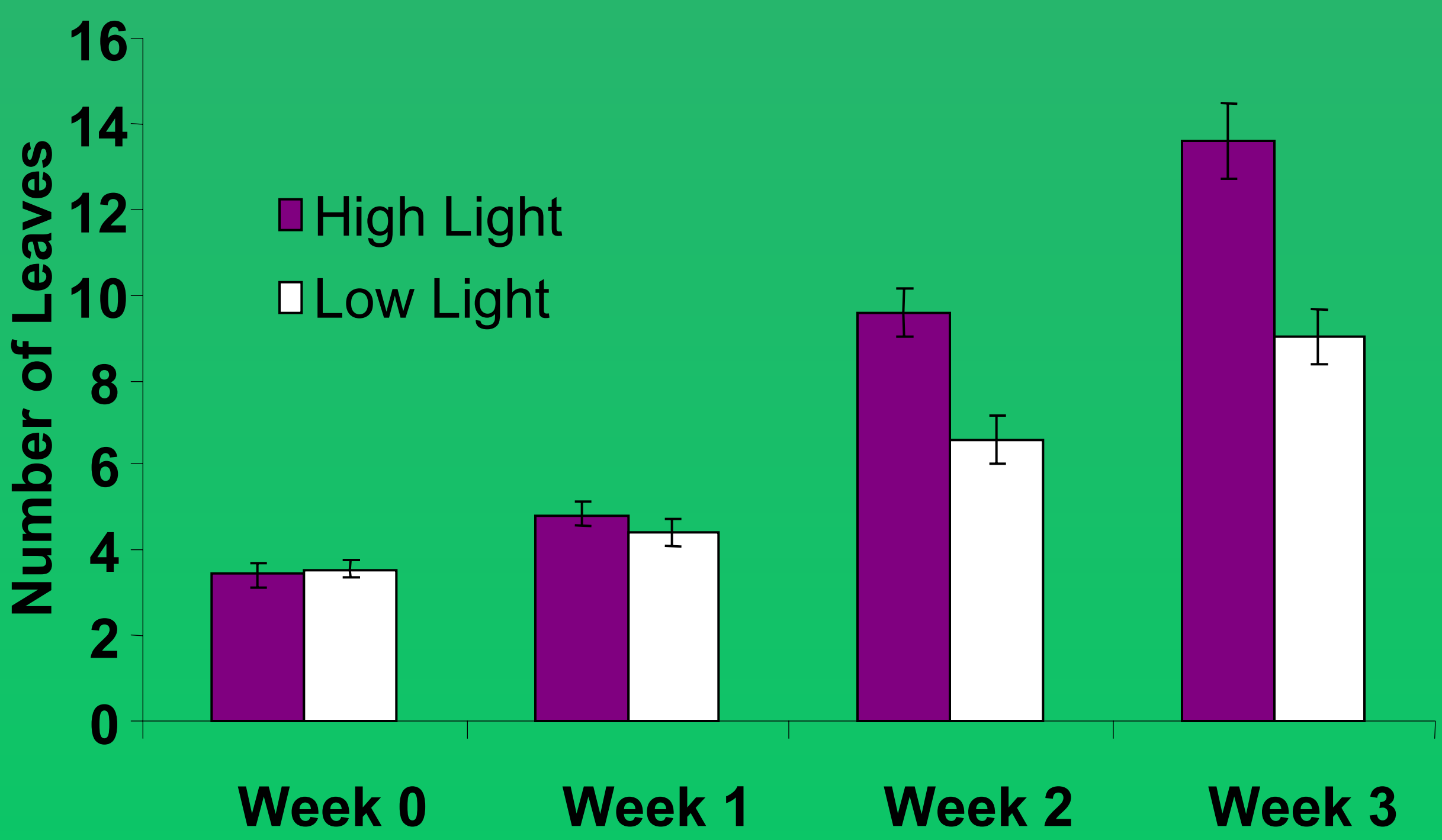
? Plants in high light developed larger shoots and roots than those in low light demonstrating adverse effects of low light intensity on development of *I. remota*.
? High light plants had lower or equal shoot:root ratios than low light plants suggesting more photosynthates into roots than shoots.



Seedlings grown in vermiculite



Number of leaves per plant at two light intensities.



? Significant differences between the two light intensities for number of leaves developed at week 2.

SIGNIFICANCE

- ? Shade from invasive woody shrubs such as *L. maackii* and *Rosa multiflora* will have a detrimental effect on growth of *I. remota* by reducing light.
- ? Restoration efforts should reduce competition around *I. remota*. New populations should be planted in open areas.

LITERATURE CITED

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