The Effects of Saltwater Concentrations on Germination and Growth of the Federally Threatened *Aeschynomene virginica* (Sensitive Joint-Vetch) Fabaceae.

Tahiri Contreras and Bryan A. Connolly

[1] Eastern Connecticut State University, Biology Dept., 83 Windham St., Willimantic, CT 06226

Introduction

•*Aeschynomene virginica* (Sensitive joint-vetch) is a federally threatened species (United States Fish and Wildlife Service, 1992).

•This species grows in freshwater tidal wetlands (Griffith et al., 2003). Populations are found along the coast of Maryland, New Jersey, North Carolina, and plants can reach 2 meters in height.

•Flowers of sensitive joint-vetch (*Aeschynomene virginica*)

(https://www.earth.com/endangered-species/aeschynomene-virginica/)

•*Aeschynomene virginica* numbers are declining. Extirpation has already occurred in Delaware and Pennsylvania (Tyndall, 2011).

•By studying *A. virginica*, we can better understand the salinity threshold of these endangered legumes to make more informed conservation decisions for its long-term survival.

•Higher tides increase salinity levels and may exceed the limits of this species (Chaffins and Baskin, 1998). Climate change induced ocean level rise may increase salinity in the species current habitat.

•Previous studies have shown that a 1.0% salt solution significantly decreases germination of nondormant sensitive joint-vetch. Here, we used a similar approach but tested lower salt concentrations on the sensitive joint-vetch seeds.

•**Hypothesis: An increase in salinity will have a significant effect on the germination, growth, and development of nondormant *A. virginica* seeds**.

Materials and Methods

•Two treatment groups of saltwater concentrations were tested; de-ionized water (Control), 0.25% saltwater, and 0.5% saltwater.

•40 replicates per treatment, each with five seeds per petri dish.

•A total of 600 *A. virginica* seeds were obtained from the Brooklyn Botanic Garden.

•Salt-water concentration was measured prior to application using a conductivity meter.

•To avoid evaporation, all samples were covered under plastic food wrap. Each sample was also moved every three days to ensure equal light treatments.

•Data was collected over the course of one week, every 3 days, once germination occurred.

•Roots and stem lengths were recorded. A germination count was also conducted for each individual petri dish.

•Data was analyzed using an ANOVA and Tukey HSD test.

Results

• At day 3, there was no significant difference in germination between the control and 0.5% treatment. There was also no significant difference between 0.25% and 0.5% treatments. There was, however, a significant difference between the control and 0.25% treatment ($p = 0.036$).
•Germination rate, there were no significant differences between the control and 0.25% treatment and the control with 0.5% treatment. Significant difference was found between 0.25% and 0.5% salinity treatment ($p = 0.034$).

•Day 7, there was no significant difference in plant root and stem length between the control and 0.25% treatment; however, there were significant differences between the control and 0.5% ($p = 0.001$) and significant differences between 0.25% and 0.5% salinity treatments ($p = 0.001$).
•No significant differences were shown between any of the treatments during the second count of germinated seeds per petri dish.

Results (continued)

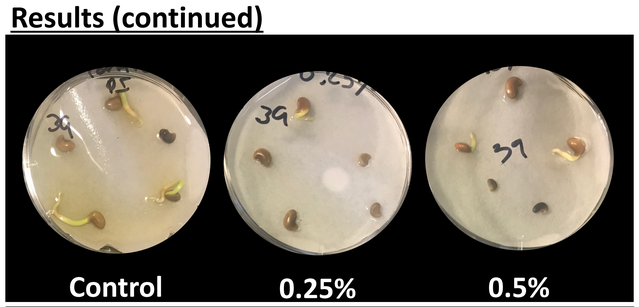

Figure 1. Seed germination treatments of *A. virginica* day 3

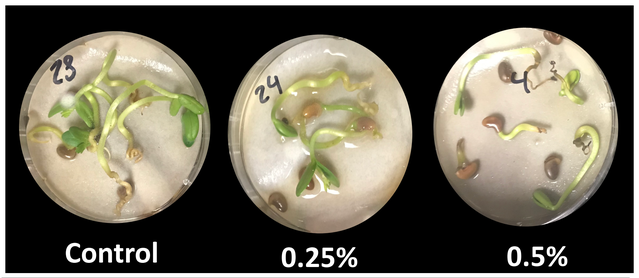

Figure 2. Seed germination treatments of *A. virginica* day 7.

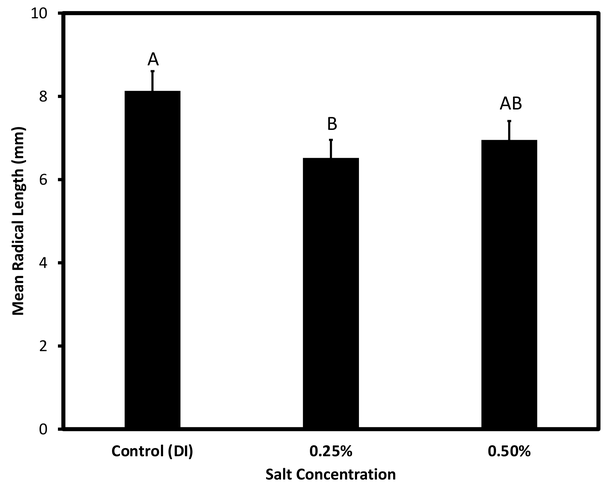

Figure 3. Day 3, the mean radical length ± SE of *A. virginica* ANOVA (p=0.036) Tukey HSD

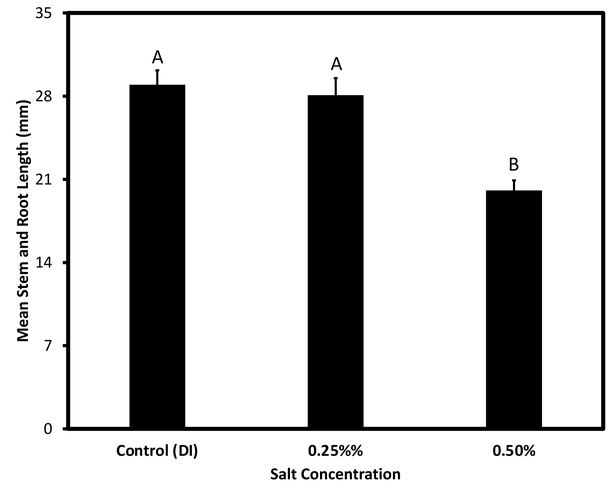

Figure 4. Day 7, the mean stem and root length ± SE of *A. virginica* ANOVA (p= 0.001, p= 0.001) Tukey HSD

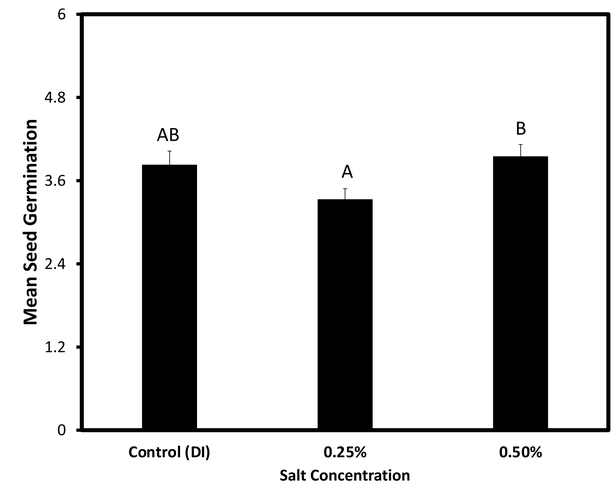

Figure 5. Day 3, the mean seed germination ± SE of *A. virginica* ANOVA (p=0.034) Tukey HSD

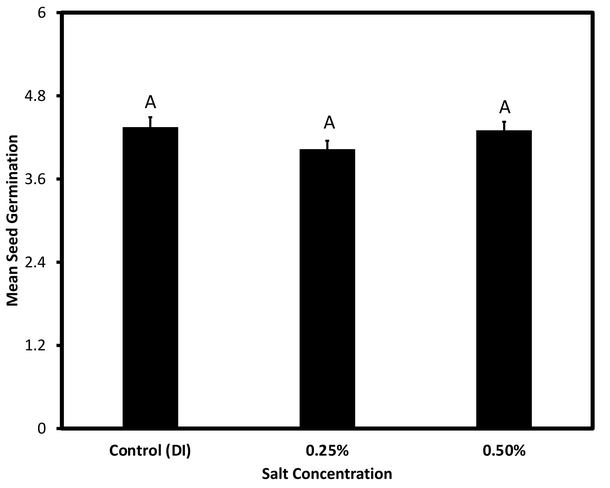

Figure 6. Day 7, the mean seed germination ± SE of *A. virginica.* No significant differences in germination count for any treatment ANOVA Tukey HSD shown

Discussion

•Previous studies have shown a significant effect of salinity levels at 1%; however, we saw significant impacts as low as 0.25% and 0.5%, suggesting that sensitive join-vetch can be affected at lower salt conditions than previously documented.
•At 3 days, salt concentration delayed germination, by 7 days germination difference decreased though plant length was significantly different between treatments.
•After a week, higher concentrations of salinity resulted in the reduction of stem and root size, suggesting a negative relationship between *A. virginica* and salt water.
•From our data we can conclude that salinity levels even below 1% can negatively impact this federally threatened species.

Literature Cited

1. United States Fish and Wildlife Service. (1992). "Sensitive Joint-Vetch (*Aeschynmomene virginica* Recover Plan". Hadley, Massachusetts. 55 pp.
2. Tyndall R. W. (2011). "Long-Term Monitoring of Two Subpopulations of the Federally Threatened *Aeschynomene virginica* (Sensitive Joint-vetch) in Maryland. Castanea, 76(1):20-27
3. Griffith A. B., Forseth I. N. (2003). "Establishment and reproduction of Aeschynomne virginica L.) (Favaceae) a rare, annual, wetland species in relation to vegetation removal and water level". Plant Ecology. 167: 117-125.
4. Baskin J. M, Tyndall R. Wa., Tyndall R. W., Chaffins M., Baskin C. C. (1998). "Effect of salinity on germination and viability of nondormant seeds of the federal-threatened species *Aeschynomene virginica* (Fabacceae). Journal of the Torrey Botanical Society. 125(3) pp. 246-248

Acknowledgment

Thank you to Uli Lorimer, Director of Horticulture at the Native Plant Trust for obtaining *A. virginica* seeds from the Brooklyn Botanic Garden