Morphological Variation in Medicago polymorpha Pods
Lauren Otaguro, Wendy Vu, Maren Friesen
Advisor: Sergey Nuzhdin
USC WiSE Undergraduate Research Fellowship

Introduction

Nitrogen is more often than not a limiting factor in plant growth. Consequently, legumes of the genus Medicago have developed a way to better assimilate nitrogen; by forming a symbiotic relationship with N-fixing rhizobium bacteria, they are able to grow in soils with harsh conditions, like saline and serpentine soils. Medicago could have the ability to remedy nutrient depleted croplands and create more sustainable lands, and is potentially ecologically important.

This project focuses on the species Medicago polymorpha, named for the many morphological variations seen in its pods, one of which is a gradient of spine length. Spine length could potentially affect pod distribution rates across Catalina Island and what genes are responsible for genetically, by performing RAD sequencing, will help to understand pod migration rates, and studying this trait both ecologically, by setting up transects simulating the Wrigley Institute for Environmental Studies.

Methods

Studying this trait both ecologically, by setting up transects simulating the natural variation in pod morphology to measure migration rates, and genetically, by performing RAD sequencing, will help to understand pod distribution rates across Catalina Island and what genes are responsible for spine length. Salinity readings were taken to understand the extent of soil heterogeneity in which Medicago is distributed.

Transsects for pod distribution rates:

Figure 1, right, shows one of the six transects near the Wrigley Institute for Environmental Studies. Each transect holds 100 pods (50 with spines and 50 with spines cut off) in the innermost circle. Pods were painted with UV paint and counted nightly. Figure 2, below, is a diagram of the quadrants in the transect.

Salinity Readings:

Soil samples were collected from:
- Catalina Cove
- Parson’s Landing
- Little Harbor
- Shark Harbor
- Hill above Shark Harbor
- Ben Westin

Salinity levels were measured using an EC meter

Results

Salinity data has shown that Medicago grows in both saline and non-saline soils that are sometimes in the same area. This means that rate of pod dispersal is important because Medicago must be able to adapt to different environments if carried elsewhere, and that pod spine length could be an important factor affecting this.

Seeds with different morphologies are currently growing, so RAD sequencing is the next step in determining the genes that control spine length. The transect data will continue being collected in order to obtain more conclusive results.