Online Proceedings

Poster Session 3

Commons East, Easel 65

2:30 PM to 4:00 PM

An Investigation into the Molecular Mechanisms Behind Plant Flowering Time in *Arabidopsis thaliana*

Rachel Anne Lee, Senior, Biology (General)
Mentor: Nayoung Lee, Biology
Mentor: Takato Imaizumi, Biology

Flowering is crucial to a plant's lifecycle because it determines reproductive success for the plant. Scientific understanding of the molecular mechanisms that direct this process are constantly being revised and expanded as more is discovered about how plants sense their environment and adjust their flowering time in order to optimize reproductive success. In this study we explore the molecular mechanisms involved in the FKF1 photoreceptor signaling pathway. FKF1 is a blue light sensitive photoreceptor that influences *FLOWERING LOCUS T* (*FT*) gene expression, which induces flowering in plants. The molecular mechanism of activation of *FT* expression under high light has not yet been fully characterized. By comparing relative gene expression in *cat2* mutants we found six transcription factors that have the potential to bind to the *FT* promoter and show significantly higher expression levels under high light conditions. Our research focuses on these six transcription factors and their potential impact on flowering time in the plant. To study these transcription factors, we are developing transgenic lines to analyze the effects of knocking down or overexpressing these genes. We will look at the resulting phenotypes of our transgenic plants in order to develop models that explain the suppressive or activating effects of our transcription factors. This will further our understanding of how plants regulate flowering under high light conditions. By achieving a deeper understanding of plant development, we can devise ways to maximize agricultural output in order to feed an ever growing global population.

Poster Session 4

MGH 241, Easel 144

4:00 PM to 6:00 PM

Genetic Analysis of the Regulatory Mechanism of *FLOWERING LOCUS T* under Matural Long-Day Conditions

Nhu Hoang Nguyen, Junior, Pre-Sciences
Undergraduate Research Conference Travel Awardee
Mentor: Takato Imaizumi, Biology
Mentor: Akane Kubota, biology

Scientists agree that recent climate changes result in decreased plant growth and agricultural efficiency. Because the timing of flowering affects plant development and biomass, it is critical to understand how environmental factors influence the flowering regulation. Photoperiod (length of a day) and temperature are the most important factors that regulate flowering timing in a model plant, *Arabidopsis thaliana*. In order to understand how these factors affect seasonal flowering in nature, the Imaizumi Lab grew *Arabidopsis* outside in Seattle, Washington during the summer solstice (16 hours light, 8 hours darkness, highest average temperature 21C, 1:1 Red:Far-red ratio), where day-length and temperature were similar to long-day (LD) lab conditions (16 hours light, 8 hours darkness, constant 22C, 2:1 Red:Far-red ratio). They discovered a unique expression pattern of the florigen gene, *FLOWERING LOCUS T* (*FT*), which promotes flowering. The lab also recreated the *FT* expression pattern by changing temperature and light settings of the LD lab conditions and found that *CONSTANS* (*CO*) and *EARLY FLOWERING 3* (*ELF3*) act as positive and negative regulators of the *FT* expression. Then, we established a double mutant *co101 elf3-1* to investigate the genetic relation between *CO* and *ELF3*. Since there is a known linear correlation between the number of leaves a plant produces and its developmental state of age, we used that as a proxy to estimate the plants' flowering timing phenotype. The *FT* expression under the recreated natural condition was also analyzed. Taken together, we found that *co101 elf3-1* flowered slightly earlier than *co101*. This suggests that *ELF3* regulates the flowering timing through both *CO*-dependent and -independent pathways. To further understand how *ELF3* regulates the flowering timing, we are currently analyzing flowering phenotype of a double mutant *ft101 elf3-1*. Our results will progress to a better understanding of the molecular mechanism of seasonal flowering in nature.