Plant Defense

Plant diseases and environmental stressors are a major cause of crop loss globally, representing a substantial obstacle in sustainable production of food and energy crops that are essential for basic human nutrition and health.

Plants cannot run away when their surroundings become hostile, so they have evolved intricate strategies to adjust to or combat adverse conditions. We study plant defense in the face of three types of threats.

He lab: Plant-microbe interactions

The He lab studies how pathogens and bacteria cause plant diseases. The group specifically researches the pathogen *Pseudomonas syringae* and how it invades plants and makes them susceptible to disease. The lab has found that, to cause disease, *P. syringae* bacteria produce a variety of virulence factors, proteins that are secreted into plants, and toxins that fool the plant into being hijacked.

Microbiome?

Howe lab: Plant-Pest interactions

The Howe lab researches how plants respond to insect herbivory and other forms of wound stress. They use both tomato and Arabidopsis (a common model plant) to investigate two areas of interest:

1. Understanding the plant hormone, jasmonate, which is responsible for defense against herbivores and insects;
2. How defensive compounds regulated by jasmonate thwart insect attack;

The lab also studies the development and metabolism of glandular trichomes in tomato – basically the small hairs on the surface of the plants. These projects provide training in several areas of modern plant biology, from basic research methods to crop improvement strategies for insect resistance.

Thomashow lab: Environmental Stressors

Abiotic stresses include extremes in temperature and water availability, for example, which are major factors that determine the natural geographical distribution of plants and limit agricultural production on an annual basis.

The Thomashow lab’s overarching interest is to understand how plants have evolved to tolerate these types of environmental stresses and use this information to improve the yield of crops used for food and bioenergy.

Much of the lab’s work has focused on cold acclimation: the process where plants increase their tolerance to freezing temperatures when they start sensing low, but still non-freezing, temperatures.