Biology Seminar

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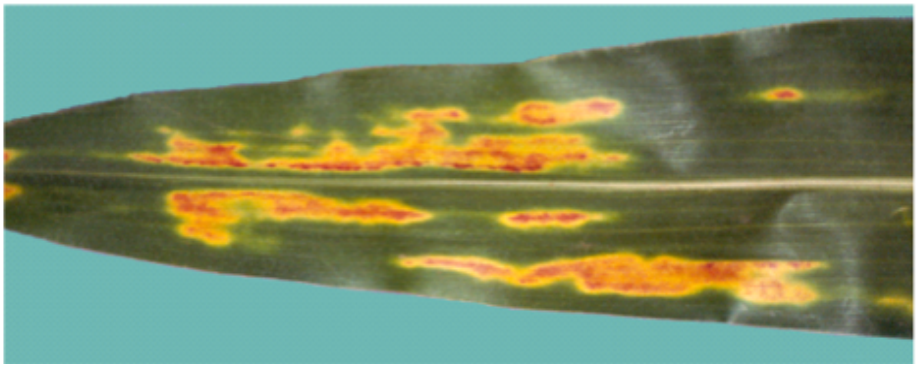
How does sugar get out of leaves and why does it matter?

Carbon partitioning is the process whereby photoassimilates are distributed from their site of synthesis in leaves to the rest of the plant. Control of carbon partitioning is crucial for plant growth and development, and underlies all aspects of crop yield. For most plants, carbon, in the form of sucrose, is loaded into the phloem and transported from leaves to non-photosynthetic tissues, such as roots and fruits. This process is well characterized at the physiological, biochemical and anatomical levels. Yet despite the obvious importance of carbon partitioning for plant growth and development, we still know very little about how it is regulated at the molecular level. The best characterized genes that directly function to load sucrose into the phloem are sucrose transporters (SUTs). Utilizing a reverse genetic approach to determine the biological functions of all SUTs in maize we discovered that SUT1 functions to load sucrose into the phloem. We are currently investigating the functions of the other SUT family members. In addition, my lab has been studying the functions of a second class of genes that control carbohydrate accumulation in maize leaves. *tie-dyed (tdy)* mutants display variegated leaves with chlorotic regions that hyperaccumulate carbohydrates. Cloning *Tdy1* revealed that it encodes a novel transmembrane protein highly conserved in grasses. Expression analyses determined that *Tdy1* mRNA is exclusively present in the phloem of all tissues. Additional forward genetic screens have identified a large collection of carbohydrate partitioning defective mutants, which hyperaccumulate starch and soluble sugars in their leaves. Through cloning and characterizing these mutants, we will provide a deeper understanding of the genes regulating sucrose entry into the phloem and carbohydrate partitioning throughout the plant.



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