

Public Abstract

First Name: Timothy

Middle Name: Patrick

Last Name: Durrett

Degree: PhD

Department: Biochemistry

Adviser's First Name: Elizabeth

Adviser's Last Name: Rogers

Co-adviser's First Name:

Co-adviser's Last Name:

Graduation Term: Summer

Graduation Year: 2006

Title: Understanding Arabidopsis Ion Homeostasis in the Post-Genomic Era: Assigning Function to Two Proteins Involved in Iron Metabolism.

Iron deficiency is the most common nutritional disorder affecting the world today and is particularly prevalent in poorer countries where the population depends primarily on plants, a poor source of bioavailable iron, for their nutritional needs. Iron deficiency in plants is also a common agricultural problem, limiting growth and reducing crop yields. Attempts to directly increase the amount of iron in plants are either impractical or too expensive to be utilized on a large scale. A more viable alternative would be to breed or genetically engineer food crops that were more efficient in acquiring and storing iron. However, a better understanding of the complex mechanisms involved in these processes is needed before such crops can be developed. Two different projects studying different aspects of iron deficiency in the model plant *Arabidopsis thaliana* are described here.

The first project involves the characterization of an Arabidopsis mutant that fails to activate one of the biochemical activities involved in iron uptake. These plants contained mutations in a protein important for targeting other proteins to chloroplasts in the leaves. A number of different hypotheses were considered in an attempt to explain how this defect in chloroplasts could affect responses to iron deficiency in the roots.

The second project involves the further characterization of the protein FRD3. Previous work has demonstrated that this protein is necessary for the correct distribution of iron in Arabidopsis plants. We show that FRD3 transports citric acid into the xylem vessels responsible for transporting water and mineral nutrients from the roots to the shoots. This transport of citric acid via FRD3 is necessary for the efficient translocation of iron in the xylem throughout the plant. The identification of the protein responsible for transporting citric acid into the xylem could have important agronomic implications. Earlier work has demonstrated that soybean varieties resistant to iron deficiency possess higher levels of citric acid in their xylem. The FRD3 protein therefore could be an important target for further study in order to create more iron efficient plants.