

Gilok Shin, Biochemistry

University: Gyeongsang National University

Year in School: Senior

Hometown: Jinju, South Korea

Faculty Mentor: Dr. Heidi Appel and Dr. Jack Schultz, Plant Science

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What is a plant gall and how do insects make them?

Gilok Shin, Erin Michelle Finefield, Adam M Casey, Jack Schultz, and Heidi Appel

Galls are novel plant organs, produced under the insect's direction. These ecotopic organs provide food and shelter for the developing larvae. The cell of many galls are richer in starch and sugars than normal tissues and the insect uses this rich food to grow in a protected place. In a previous study of galls on grape leaves, the lab found that plant genes specifying the vegetative-to-reproductive transition and fruit and seed identity were expressed in developing galls. To fully test the hypothesis that insects make plant galls by upregulating fruit genes, one needs to block expression of the genes and show that a gall can't be made. This is difficult to do in grape but can be done in poplar, so we are working with galls on poplar leaves. In poplar leaves with or without galls, sectioned and stained using Toluene Blue O dye and examined under polarized light at 20 magnification, we identified changes that galls make in leaf development. We detected a number of histological changes in galled leaves, including patterning of xylem & phloem, palisade and spongy parenchyma. We prepared RNA from fruit, ungalled leaf and galled leaf to study differences in their expression of meristem identity and carpel genes. Although we didn't have time to do the gene expression work, we predict that the expression of fruit genes will be elevated in the gall tissue compared to surrounding normal leaf tissue.