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P3 Campus Lead

Academic interests: Diverse aspects of plant biology, ranging from biochemical analysis of secondary metabolic pathways to environmental signaling mechanisms and stress ecophysiology. I also have a strong interest in the pharmacological and nutritional properties of plant natural products, and in particular antioxidants, and the effects of these phytochemicals on human health.

Research Focus & Techniques of Expertise: Photoacclimation of Polyphenolic Antioxidants in Higher Plants: A Potential Tool for Metabolic Engineering: Research in our laboratory has two primary aims: (1) understanding the role of phenylpropanoid metabolism in high light stress responses of higher plants, and (2) assessing whether the antioxidant activity of phenylpropanoids is an integral part of their physiological function *in vivo*. Our current focus is on tomato (*Solanum lycopersicum*), one of several agronomically important crop plants currently being explored as a model for plant metabolic engineering. Tomato is an excellent platform for biochemical, genetic and molecular research due to its moderately sized genome, tolerance to inbreeding, amenability to genetic transformation, and diversity of secondary metabolism. We are currently using a functional genomics approach to elucidate the molecular mechanisms of high light regulation of flavonoid and hydroxycinnamic acid biosynthesis in tomato. In addition to studying the expression of the major biosynthetic genes, we are using findings from other plant species (*Arabidopsis*, petunia, maize) to identify the transcriptional regulatory factors and *cis*-acting elements that are required high light activation of phenylpropanoid biosynthesis in tomato. Our long term goal is to use this information to generate mutants with altered phenylpropanoid metabolism as a means to assess the function of this pathway in specific stress responses. In addition, characterization of the photoregulation of phenylpropanoid metabolism in tomato, a crop of worldwide agricultural importance, ultimately may allow targeted manipulation of the light signal transduction machinery as an effective strategy for enhancement of tomato fruit antioxidant capacity and nutritional quality.

Grants

Grant P3-206: Photoregulation of phenylpropanoid antioxidant production in tomato.
PI: Stephen Grace (UALR); **Co-PI's:** Mariya Khodakovskaya (UALR), JD Swanson (UCA)

Grant P3-202: Regulation of secondary metabolism in tomato by genetic manipulation of the phosphoinositol pathway.
PIs: Mariya Khodakovskaya (UALR); **Co-PI's:** Stephen Grace (UALR), Nawab Ali (UALR), Fabricio Medina-Bolivar (ASU)

Grant P3-108: Metabolic & genomics empowered platform for phytochemical and gene network discovery in *Medicago trancatula*.
PI: Hong Li Wang (UALR); **Co-PI's**: Xiuzhen Huang (ASU), Stephen Grace (UALR), Nawab Ali (UALR)