**KAUST-University of Arizona Summer Seminar Series: Towards a Joint Center for Sustainable Agriculture in Desert Environments**

**Salim Al-Babili & Monica Schmidt**

**Tuesday, June 22**

**9:00-10:30 am MST**

**On** [**Zoom**](https://kaust.zoom.us/j/93988721070)

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**password: 905015**

**Carotenoid Metabolism: A Mine for Plant Growth Regulators**

Speaker: Salim Al-Babili

Professor of Plant Science, KAUST

**Abstract**

The breakdown of carotenoids is the initial step in the formation of known plant hormones, such as strigolactones, and of yet-unidentified carotenoid-derivatives, apocarotenoids, supposed to regulate plant growth and development. In the last years, we have been focusing on strigolactone biosynthesis and on the discovery of novel apocarotenoid growth regulators. For this purpose, we study the activity of carotenoid modifying enzymes, generate and phenotype corresponding mutants and test the activity of known and presumed carotenoid cleavage products. In this talk, I will describe the discovery of anchorene, a carotenoid-derived di-aldehyde, as the specific signal needed for the formation of anchor roots in Arabidopsis, and present our results about zaxinone, a candidate for a novel plant hormone that promotes rice growth and determines its hormone homeostasis and architecture. Finally, I will briefly present how we translate our findings into agricultural applications, such as combating the root parasitic plant Striga, a major threat to global food security.

**About the Speaker**

Salim Al-Babili received his PhD from the University of Freiburg, Germany. After his PhD, he obtained a Rockefeller Post-Doc fellowship to develop “Golden Rice” in the lab of Peter Beyer and in collaboration with the group of Ingo Potrykus. In 2007, he received his Habilitation in Cell Biology at the University of Freiburg and is currently Professor for Bioscience at King Abdullah University of Science and Technology (KAUST). The general objective of his research group is to improve the performance and nutritional value of crops by genetic engineering or by developing hormone-based approaches. His lab combines metabolomics with enzymology-based and genetic approaches to elucidate metabolic networks and identify new signaling molecules related to abiotic/biotic stress response and plant development. He has made essential contributions to engineering crops with enhanced pro-vitamin A content and the elucidation of carotenoid/apocarotenoid metabolism in plants and microorganisms. His discovery of the metabolite carlactone deciphered the core pathway in the biosynthesis of the plant hormone strigolactone. He is currently heading an international consortium funded by the Bill & Melinda Gates Foundation to combat the root parasitic plant *Striga hermonthica*, a major threat to global food security, in sub-Saharan Africa.

**Engineering functional foods**

Speaker: Monica Schmidt

Associate Professor, School of Plant Sciences, University of Arizona

**Abstract**

An overview of some of the functional food and functional genomic projects that are on-going in the laboratory will be presented. Strategies to enhance the nutrition of food/feed items include both the addition of compounds and/or the elimination of compounds. Pioneering efforts to reduce/eliminate contaminating fungal-produced aflatoxin in crops using RNAi suppression are currently being coupled with toxin-degradation strategies during both pre- and post-harvest conditions to recover the millions of tons lost due to this carcinogenic compound. The addition of nutraceutical carotenoids in seeds has been successful in many crop species. There are over 700 carotenoids in nature with six of these colorful compounds displaying health benefits. Seed-specific metabolic engineering strategies were successful at the biofortification of the eye-healthy carotenoids, B-carotene and zeaxanthin, as well as the potent antioxidant and fish colorant, astaxanthin, in soybean, brassica or Camelina sativa seeds. Interestingly, seeds with enhanced carotenoid content have an elevated protein content, likely due to altered levels of the carotenoid-derived phytohormone abscisic acid. Functional genomic projects are on-going for candidate genes involved in this pathway to create enhanced protein without modified carotenoid content. Currently, the world health organization estimates 1/3 of the world’s children suffer from protein deficiency. Strategies to engineer or breed enhanced protein content in crops should have a significant role in alleviating nutritional deficiencies.

**About the Speaker**

Monica Schmidt received her BSc from The University of Windsor and her PhD in Genetics from The University of British Columbia, followed by post-doctorate positions at The University of Georgia and the USDA at The Danforth Plant Science Center. She participates in the development of solutions to some of the major global agricultural problems. She works on enhancing seed traits in two of the most globally important crops, soybean and corn. Her research program leverages basic plant science to produce biotechnology output traits that enhance nutrition and food safety in crops. She colloquially describes her research program as functional foods -- extending food/feed function beyond the delivery of mere calories for the benefit of the consumer. Her research interests have two primary goals: (1) enhancing food items through metabolic engineering, and (2) assessing the genetic risk underlying biotechnology techniques.  Soybean production will need to double by 2050, making this crop an ideal vehicle for biotechnological strategies to create new varieties to serve as protein factories to produce better food, feed, and industrial proteins, as well as to produce modified oils. She has worked on the fortification of soybean seeds with nutritionally beneficial carotenoids as well as enhancement of overall protein content. Her efforts in maize have largely focused on the recovery of crop losses due to toxic secondary compounds produced from contaminating fungal species. Her research efforts should have a significant impact on the success/acceptance of the next wave of biotechnology, known as the second green revolution, by focusing on the enhancement of crops for the betterment of humankind and impacting global food safety and security.

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