Our research goal is to improve the nutritional quality and health-promoting properties of food crops. Currently, we focus primarily on gene discovery and understanding of the bases underlying the accumulation of phytonutrients and micronutrients in plants, as well as on plant biotechnology and biofortification of food crops.

Carotenoid Research

Carotenoids are indispensable to plants and play a critical role in human nutrition and health. Carotenoids are synthesized and accumulated in high levels in chromoplasts, which serve as a metabolic sink. By investigating a high-β-carotene *Or* (*Orange*) gene in vegetables and fruit, we have elucidated a regulatory control mechanism of carotenoid accumulation by inducing the differentiation of plastids into chromoplasts. Our recent research in this area focuses on unraveling new players in the chromoplast biogenesis pathway and providing novel mechanistic insights into the understanding of chromoplast formation and carotenoid accumulation in crops. We hope to use these novel genetic elements and knowledge to breed food crops with greatly enhanced carotenoid levels and stability.

We also use molecular, genetic, biochemical, omics approaches to discover new genes and investigate the cellular and metabolic processes that regulate high levels of carotenoid accumulation in horticultural crops.

Flavonoid Research

Flavonoids fulfill important biological functions in protecting plants against various biotic and abiotic stresses, and serve as valuable diet antioxidants in reducing the risk of a number of human diseases. We are using *Brassica* vegetable germplasms to identify important genes controlling flavonoid levels and investigating the control mechanisms of flavonoid metabolism in vegetables.

Selenium and Glucosinolate Research

Selenium is an essential micronutrient for humans and has important health benefits including as a cancer preventative agent. Glucosinolate hydrolysis products serve as chemopreventive compounds. We are identifying and characterizing the potential important genes controlling selenium and glucosinolate metabolism in *Brassica* species. In addition, we investigate factors affecting the accumulation of functional forms of selenium and glucosinolates in plants.

Plant Biotechnology and Biofortification

Plant biotechnology approach including genome editing is utilized to alter genes important for phytonutrient metabolism in order to enrich nutritionally available and health-beneficial compounds in crops. We also investigate zinc, iron, and selenium plant nutrition in various staple crops for biofortification to improve nutritional qualify of food crops.