

Analysis of Phytoene Desaturase (PDS) During the Development of Root and Leaf Tissue of the *Rp* Mutant in Carrot (*Daucus carota*)

Megan J. Bowman¹, Anne E. Atkins¹, Irwin L. Goldman³, and Philipp W. Simon^{2,3}

¹Plant Breeding and Plant Genetics Program, University of Wisconsin-Madison, Madison, WI, USA

²USDA-ARS, Vegetable Crops Research Unit, Madison, WI USA

³Dept. of Horticulture, University of Wisconsin-Madison, Madison, WI, USA

The *Rp* (Reduced Pigment) mutation in carrot is characterized as a single recessive gene causing decreased levels of β -carotene and α -carotene, increased levels of phytoene accumulation in the storage root, chlorotic patches on the carrot leaf, and stunted growth. In the carotenoid biosynthetic pathway, phytoene is metabolized to ζ -carotene by the enzyme phytoene desaturase (PDS), making the carotenoid biosynthesis pathway of interest for further research regarding the *Rp* mutation. High performance liquid chromatography was used to measure the accumulation of carotenoid pigments in the leaf and root tissue during several harvest periods during plant development, and a comparison sequence analysis was conducted of the coding region of the carotenoid biosynthesis gene phytoene desaturase (PDS) in *Rp* as well as other pigmented carrot germplasm. Using real time quantitative PCR, the expression of phytoene desaturase was quantified in carrot leaf and root tissue over three periods of development in both *Rp* and W266, the background germplasm from which the *Rp* mutation was isolated. Pigment accumulation, sequence differences, and the analysis of differential expression of genes during the accumulation of carotenoid pigments throughout the entire *Rp* carrot plant will be analyzed.