Natural variation in the serially duplicated *Production of Anthocyanin Pigment* loci and anthocyanin accumulation in *Arabidopsis thaliana* (Brassicaceae)

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I dedicate this thesis to my future children.

May they have a rich father and a beautiful mother.

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1. Abstract

The TTG1-regulatory gene network regulates the development of all epidermal cell fates in *Arabidopsis thaliana.* Four members of the TTG1 complex, the serially duplicated R2R3-MYB *PRODUCTION OF ANTHOCYANIN PIGMENT* (*PAP*) genes, have previously been implicated in regulating the late stages of anthocyanin bionsynthesis in *Arabidopsis thaliana*. To study the effects of gene duplication, we sought to determine the extent of variation in each *PAP* gene compared to a single copy gene of the TTG1 network, *WEREWOLF*, using 48 naturally occurring *A. thaliana* accessions. It appears that the predominantly expressed *PAP1* gene demonstrates a biallelic pattern, consistent with other *A. thaliana* genes. All four genes fall below the average nucleotide diversity levels observed across *A. thaliana;* however, *WEREWOLF* demonstrates almost complete sequence conservation across the 48 accessions used in this study. We attempted to determine the relative ages of the four *PAP* genes, though this does not appear to correlate with accumulation of genetic variation. To investigate the genetic architecture of anthocyanin accumulation in *A. thaliana,* we performed an heritability and quantitative trait loci mapping analysis using a recombinant inbred line population derived from 19 natural *A. thaliana* accessions. While QTL were mapped for anthocyanin accumulation near several of the *PAP* genes, we observed a number of loci with no obvious candidate genes, providing novel insights into the genetic architecture of anthocyanin accumulation in *A. thaliana.* This work contributes to a greater understanding of the roles of regulatory genes in biosynthesis and the molecular basis of regulation as well as the effects of gene duplication on nucleotide variation in the resulting genes.