

CHROMATIN-LEVEL REGULATION OF THE MAIZE *PURPLE PLANT1* GENE

Kyungju Shin

Dr. Karen Cone, Dissertation Supervisor

ABSTRACT

In eukaryotes, gene expression is controlled at the chromatin level by mechanisms that are not yet well understood. This study addressed some of the unanswered questions about chromatin-level gene regulation. In maize, the *PI1-Blotched* allele of *purple plant1* (*pl1*) leads to a variegated pattern of anthocyanin pigmentation. Pigmentation of *PI1-Blotched* plants is increased by presence of the modifier *Suppressor of plant blotching* (*Spb*), and the higher pigment level is correlated with increased *PI1-Blotched* expression and altered DNA methylation. These observations led to the hypothesis that *Spb* modulates *PI1-Blotched* expression by altering the chromatin structure of the gene. To evaluate this idea, DNase I sensitivity and chromatin immunoprecipitation assays were used to analyze the effect of *Spb* on *PI1-Blotched* chromatin structure and QTL mapping was used to estimate the number of genes *Spb* comprises. Results suggest that *Spb* activates *PI1-Blotched* expression by chromatin remodeling, which leads to more relaxed chromatin structure, elevated levels of "active" histone modifications, and altered nucleosome positioning. Moreover, the data suggest that these effects are brought about by multiple proteins that act together to modify *PI1-Blotched* chromatin. The insights provided by this study have led to increased understanding of chromatin-level regulation of gene expression.