Translating frost tolerant seed degreening from Arabidopsis to Canola

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Non-lethal frost during key stages of *Brassica napus* (canola) embryo development is known to significantly increase canola seed chlorophyll levels. High green seed content reduces canola pricing causing significant economic losses to canola producers. Components of the seed de- greening pathway have been identified in the model species *Arabidopsis thaliana*. ABI3, a transcription factor implicated in mediating abscisic acid (ABA) responses has been shown using a microarray to regulate a suite of genes largely relating to seed maturation and de-greening. Specifically, during seed maturation ABI3 is required for the transcriptional activation of the downstream *SGR2* (stay-green) gene by binding to the SGR2 promoter, to drive degreening. In *Arabidopsis*, overexpression of *ABI3* was sufficient to impart frost-tolerant degreening. Given the high level of sequence similarity of *SGR2* and *ABI3* between *Arabidopsis* and *Brassica,* it is expected that the system can be efficiently translated into Canola. To achieve this, *Brassica napus* homologs of *SGR2* and *ABI3* were isolated and tested for their ability to perform similar functions through complementation using a suite of Arabidopsis mutants. In parallel, canola transgenics that ectopically express ABI3 have been developed. These transgenics were able to degreen more completely than wild type following frost treatments. In spite of being expressed ectopically the downstream up-regulation of *SGR2* was restricted to seeds suggesting additional regulation in the leaves prevents *ABI3* overexpression from resulting in premature chlorophyll catabolism in leaves. In addition estimations of the transgenic lines growth characteristics and yield suggest an absence of deleterious pleiotropic effects.