The Effect of Heat Stress on Constitutively Expressed Flowering Inhibitor Genes in Arabidopsis thaliana and the Onset of Early Bolting

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Early bolting is the process by which plants flower prematurely in response to stress factors such as extreme heat or drought. In Brassicaceae crops such as cabbage and broccoli, this heat stress has the potential to decrease yields and in the US cost $17.3 billion in 2012. FLC and TFL1 are two repressible genes in Arabidopsis thaliana, model organism for the Brassicaceae family, that suppress flowering. After a period of time, or when subjected to heat stress, these genes are gradually down-regulated and flowering occurs. In this study, 35sFLC and 35sTFL1 Arabidopsis mutants (constitutive expression of FLC and TFL1 respectively) and the Ler wild-type were subjected to short term heat stress ranging from 90-180 minutes. The plants were checked daily for buds, leaf count, and flowering. Results show that the FLC strain experienced early bolting at a lower rate than the Ler, and that stressed plants in the TFL1 strain did not experience early bolting until after two full weeks. Both budded with higher leaf counts than Ler. These results show that constitutive expression of flowering inhibitor genes greatly delay bolting among agricultural plants, ameliorating the costs of crop loss to farmers.

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