

Title Molecular analysis of ethylene-induced fruit thinning and trichome development in peach
Author Ali Taheri
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Abstract

Peaches and nectarines (*Prunus persica*(L.) Batsch) are grown in temperate and subtropical zones worldwide and are a significant fruit crop in Canada. The focus of this study was thinning peaches with ethephon and cloning and measuring the expression of the genes in ethylene pathway and trichome development. Fruit size is an important trait that determines crop value, and this can be optimised by adjusting the number of fruit on the tree by manually thinning. The first objective of this study was to test the effectiveness of foliar applications of ethephon on peach fruit abscission. Different concentrations of ethephon were applied to 'Redhaven' peach trees 45-50 days after full bloom. Abscission was linearly related to ethephon concentration and reduced the requirement for hand thinning. These data indicate that ethephon at a rate of 100-200 mg/L can be used to induce fruit abscission.

CTR1 is downstream of ethylene receptors and negatively regulates ethylene pathway. Binding of ethylene to the receptors inactivates *CTR1* and results in the activation of downstream genes including *EIN2* and *EIN3* . In order to study the response of these genes to exogenous ethylene, ethephon was applied to immature peach fruits and *CTR1* , *EIN2* and *EIN3* were measured. The results indicated that all three genes are upregulated 6, 24 and 24 hr for *CTR1* , *EIN2* and *EIN3* , respectively after ethephon application.

The main difference between peach and nectarine fruit is in the hairiness of peach fruit. A single locus (G) responsible for this trait has been mapped in the *Prunus* reference map. It was hypothesised that similar genes in trichome development in *Arabidopsis* are also involved in peach fruit fuzz development. *TTG1* and *GL2* orthologs were cloned from peach fruit. *TTG1* was also positioned at the G locus. Functional studies were carried out by transforming *Arabidopsis ttg1* mutant with the full length peach *TTG1* and it successfully restored the lost function in the mutant. The fact that peach *TTG1* was located at the same BAC clone as the G locus and was able to complement the *Arabidopsis ttg1* mutant, makes *TTG1* a good candidate for being the main gene involved in peach and nectarine differentiation.