

Title Effects of chilling on tomato fruit ripening
Author Adirek Rugkong and Christopher B Watkins
Citation Thesis, Doctor of Philosophy , Cornell University. 2009.
Keywords Chilling; Tomato; Fruit ripening; *Solanum lycopersicum*

Abstract

The alteration of fruit ripening is a common chilling injury (CI) symptom in tomato. To evaluate whether tomato can be used as a model study for an altered fruit ripening associated with CI, the effect of chilling on fruit ripening have been investigated in tomato fruit cv. Trust (*Solanum lycopersicum* L.cv Trust) and tomato introgression line 11-2 (IL 11-2). Tomato fruit were harvested at breaker stage of maturity and ripened at 20°C for up to 14 d, or stored at 3°C for up to 4 weeks, and then ripened at 20°C.

In Trust tomato, the effects of chilling on fruit ripening were small, and the mealiness disorder was not detected. Chilling had a marked effect on gene expression, total activity, and protein accumulation of PG. However, pectin solubilization and depolymerization did not seem to be affected much by chilling. The expression of *LeEXP1* was reduced by chilling, but LeEXP1 protein accumulation level was not affected. Post-transcriptional regulation of PG and LeEXP1 affected by chilling was observed. In IL 11-2 tomato, the effects of chilling on fruit ripening and the expression of ripening-related genes were investigated. Genes involved in color development: *PSY1*, *CRTISO*, *GGPPS2*, and *DXS*; cell-wall modification: *PG*, *PE1*, *TBG4*, *LeEXP1*, and *XTH5*; and volatile biosynthesis: *TomloxC*, *ADH2*, and *ATT*, were down-regulated by chilling. The alteration of ethylene production correlated with the altered *ACS2*, *ACS4* , and *ACO1* expression. The expression of genes involved in ethylene signal transduction pathway such as *LeETR1*, *NR*, *LeETR4*, *LeCTR1*, *LeEIL3*, *LeEIL4*, and *LeERF3* was altered by chilling. The gene expression of *LeMADS-RIN* , a ripening-regulated transcription factor, was down-regulated by chilling. The microarray analysis suggested other transcription factors may be involved in altered fruit ripening associated with CI. In conclusion, IL 11-2 tomato had the potential of being used as a model to study of the effects of chilling in fruit ripening. How chilling affects fruit ripening at the transcriptional and post-transcriptional levels should be studied in this tomato.