

Molecular Analysis of Degreening and Regreening in Valencia Orange

Kentaro Inoue

Plant Sciences, UC/Davis

Mature orange fruits change their peel color from green to orange during ripening. This degreening is an important process to determine the commercial quality of fruits. After reaching the full-ripe stage, some late season varieties such as Valencia turn their fruit peel color from orange to green. The regreened fruits are ripe inside, but cannot sell well due to their unripe-like appearance. The funded project aims to understand the molecular bases of this peel color development of citrus fruit, and to use the outcomes to develop efficient strategies to enhance color development and prevent regreening from happening.

FY2007-2008 was the second year of what was anticipated to be a three-year project. We have extended the achievement in the first year and made the following four major accomplishments. First, by gene expression analyses, we identified three genes which are involved in the biosynthesis of pigments in green but not orange tissues, as potential markers to predict regreening of still-orange fruits. Second, we obtained the data suggesting that the regreened ripe fruits may experience a higher stress than that experienced by the green unripe fruits. Third, we showed that the level of a subset of proteins appeared to correlate with the amount of their gene expression. Finally, we established an *in vitro* system to show that potassium nitrate induced regreening of orange peel. The last accomplishment is particularly important. This new system can be used to test effects of various compounds, such as growth regulators and their inhibitors, on gene expression and color development of citrus peel. The outcome of these assays should be used to develop efficient strategies to control citrus peel color development using the field trial system.



Valencia orange peel segments cultured for 2 weeks on
The media containing 200 mM sucrose (left=still orange) or
146 mM sucrose and 60 mM KNO₃ (right-regreened)

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