

Title Modelling the effect of holding temperature on flesh de-greening of 'Hort16A' (ZESPRI™ GOLD) kiwifruit

Authors H.N. De Silva, A.J. Hall, J. Burdon, N. Lallu, P. Connolly, N. Amos

Citation ISHS Acta Horticulturae 753:769-776. 2007.

Keywords *Actinidia chinensis*; hue angle; thermal-time; logistic; mixed model

Abstract

Flesh de-greening and the associated unmasking of yellow colour is an important process in preparing 'Hort16A' kiwifruit for consumers. The consumer perceives yellow colouration as an indication of ripeness and quality. The ability to control flesh colour development in early harvested 'Hort16A' kiwifruit is critical for ZESPRI's ability to supply fruit to markets earlier than usual. Loss of green colour in fruit is caused by an enzyme-mediated breakdown of chlorophyll into colourless compounds. The key to this irreversible process is an enzyme called PaO, pheophorbide a oxygenase - a reaction that probably follows first-order kinetics. Rate of de-greening is likely to be temperature dependent and the optimum temperature will vary, depending on the type of fruit, or even the variety. This paper develops a framework for modelling temperature dependence of the de-greening process in 'Hort16A' kiwifruit. The data for modelling came from a ZESPRI trial in which 10 orchards were each harvested on three occasions at two week intervals before the normal harvest, and fruit stored at four different holding temperatures, 1.5, 5, 10 and 15°C. Fruit in storage were destructively measured for colour and other maturity attributes. As chlorophyll degraded during maturation, the flesh hue angle decreased in a sigmoid pattern from a value of ~115° in immature fruit to ~97° in fully ripened fruit. To simplify model formulation, a "normalised hue angle" H^* , which always lies between 0 and 1, was used. The modelling objective then was to determine and parameterise a rate function, $dH^*/dt = h(T, H^*)$, where T is the holding temperature. The above equation was further simplified using a "thermal time", t^* instead of the real time, t . The formulated model was then fitted to the data and its use in making predictions assessed. The model is yet to be validated with an independent dataset.