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## A delay between a 38 °C pretreatment and damaging high and low temperature treatments influences pretreatment efficacy in ‘Hass’ avocados

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### Abstract

Pretreatments at moderate temperatures applied immediately prior to the high or low temperature treatments can reduce skin damage to avocados. These temperature tolerance-inducing pretreatments have generally been applied immediately prior to the high or low temperature. We examined whether a delay between the pretreatment and potentially damaging high and low temperatures may cause a loss in the induced tolerance. A hot air pretreatment (38 °C for 6 h) applied prior to storage at 0 °C for 3 weeks with intervening delays of 1–4 days at 20 °C, showed a large reduction in chilling injury as a result of the pretreatment but that this was progressively lost with increasing delay to storage. Hot water pretreatments (38 °C for 0, 5, 20 and 60 min) increasingly reduced chilling damage at 0 °C, and heat damage from a hot water treatment (HWT) at 50 °C/10 min. With delays of up to 3–24 h prior to the HWT, heat damage was reduced for the 5 and 20 min pretreatments. However, delays up to 5 days between pretreatment and HWT, loss of heat tolerance was observed. For delays of between 1 and 5 days there was a clear loss of chilling tolerance which was more rapid than the increase in chilling injury in control treatments for the same delays. However, the effect of delays <24 h was less clear for the 5 and 20 min treatments. Heat shock protein (hsp) 17 and 70 homologous RNA levels were induced by heat pretreatments and delays lead to first an increase in RNA levels (maximum induction at 6 h), which paralleled the induced tolerance, and then a decline which was less closely associated with loss in tolerance. Thus, delayed time between thermotolerance inducing pretreatments and high or low temperatures can lead to a general reduction in tolerance, and should be considered and exploited in the application of temperature treatments. A dose response/decay model for induced tolerance fits the pattern of temperature damage and hsp expression.

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