

## Biochemistry and Gene Expression of Banana Peel Blackening during Low Temperature Storage

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### Abstract

Banana fruit of cvs. Hom Thong (*Musa acuminata*, AAA Group) and Namwa (*Musa x paradisiaca*, ABB Group) were stored at 4 and 12°C (and 85-90% RH). Visible symptoms of chilling injury (CI) in the peel, mainly browning and blackening, occurred more rapidly at 4°C. At low temperature, peel blackening was visible on day 2 in cv. Hom Thong but 2 days later in cv. Namwa and had higher electrolyte leakage and thiobarbituric acid (TBA)-reactive compounds than those stored at 12°C. Levels of total free phenolics and peroxidase (POD) activity in the peel were not correlated with blackening. A slight increase of polyphenol oxidase (PPO) activity occurred from day 0 onward in cv. Hom Thong, and could explain blackening in this cultivar, but such an increase was not found to accompany blackening in cv. Namwa. Low temperature storage resulted in a rapid increase of lipoxygenase (LOX) activity in cv. Hom Thong, which was correlated with blackening, but the later blackening in cv. Namwa was not accompanied with a rise in LOX activity while ratio of unsaturated to saturated fatty acids was higher in cv. Namwa than in cv. Hom Thong. Fruits of both cultivars were immersed for 5, 10 and 15 min in hot water (HW) treatment at 42°C or in control water at 25°C and were then stored at 4°C. HW treatment for 15 min delayed peel blackening during cold storage by about 4 days in cv. Hom Thong and by 2 days in cv. Namwa. The delay of blackening in both cultivars was correlated with an increase in the ratio of unsaturated to saturated fatty acids. There was correlation between LOX activity and levels of TBA-reactive compounds in fruits of cv. Hom Thong with HW treatment but not in cv. Namwa. The results suggested that the rapid peel blackening of cv. Hom Thong is related to detectable membrane degradation, whereas the membrane-associated changes might be below the detection limit in the slower blackening cv. Namwa. Gene expression was also affected even only in cv. Hom Thong with HW treatment. The delay of peel blackening in this cultivar was associated with reduced expression of a PPO gene, which might partially explain the lower PPO activity after HW treatment. The HW treatment also increased the abundance of a heat shock protein (Hsp70) transcript in cv. Hom Thong. Taken together the delay of blackening by HW treatment in cv. Namwa was correlated only with a change in unsaturated to saturated fatty acids, whereas in cv. Hom Thong was additionally correlated with lower activities of LOX and PPO and less mRNA abundance of a gene encoding a PPO.

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