

Issaya Pusittigul 2014: Effects of Calcium, Gibberellins and Absciscic Acid on Internal Browning of Pineapple. Doctor of Philosophy (Postharvest Technology), Major Field: Postharvest Technology, Interdisciplinary Graduate Program. Thesis Advisor: Professor Jingtair Siriphanich, Ph.D. 137 pages.

Internal browning (IB) of pineapples (*Ananas comosus* L. Merr) limits the storage life and transportation potential at low temperature. Queen (cvs. Phulae and Trad-see-thong) and Smooth Cayenne (cvs. Nanglae and Pattavia) pineapples were harvested from various planting locations in Thailand. Total calcium content was determined before storage and the remainder stored at 10 °C for 21 days, followed by 1 day at 25 °C. It was found that after storage Queen pineapple developed more IB than Smooth Cayenne pineapple. A negative correlation was found between the calcium content in both Queen ($r = -0.636$) and Smooth Cayenne ($r = -0.934$) pineapples. The effect of pre-harvest and postharvest calcium applications on IB of pineapple cv. Trad-see-thong was also studied. Fruit from plants sprayed with 0.1% calcium-boron solution combined with 150 kg/ha of calcium oxide dressing exhibited a 56% and 71% reduction of IB in the pulp and the core, respectively. In a postharvest study, calcium application by immersion of fruit stems in 1, 2 and 4% calcium chloride (CaCl_2) solutions at 25 °C (80-85% RH) for 18 hours reduced IB by 32%, 56% and 76% in pulp, respectively. However, the 2 and 4% CaCl_2 solutions caused a dark brown area in the fruit stem, which extended 2.5 cm into the core. Repeated experiments with 0-4% CaCl_2 solutions for 18 hours and 0.5-1.5% CaCl_2 solutions at 25 °C for 24-72 hours at 25 °C (80-85% RH) could not confirm the effect of postharvest calcium application on IB reduction. This suggests that calcium content is only one of the factors influencing IB in pineapples.

The relationship between the changes in endogenous gibberellin (GA) [gibberellin A₁ (GA₁), gibberellin A₃ (GA₃) and gibberellin A₄ (GA₄)] and absciscic acid (ABA) concentrations and IB in pineapple was also investigated in pineapple cvs. Trad-see-thong and Pattavia. The fruits were subjected to three different storage conditions for 21 days: 10 °C, 25 °C, or 10 °C followed by 1 day at 25 °C. In both cultivars, polyphenol oxidase (PPO) activity was found to correlate with IB and was highest in fruit transferred from 10 °C to 25 °C. Endogenous total GA (GA₁ + GA₃ + GA₄) concentrations were significantly increased after the fruit were transferred from 10 °C to 25 °C. In contrast, endogenous ABA concentrations were significantly increased during storage at 10 °C but decreased after the fruit were transferred from 10 °C to 25 °C. However, Trad-see-thong pineapple had higher endogenous total GA and ABA concentrations and developed more IB than those in Pattavia pineapple. In addition, both cultivars treated with 433 μM GA₃ for 5 min showed higher IB, PPO activity and ABA concentration than the control during storage at 25 °C. At 10 °C, GA₃ application significantly inhibited the increases in ABA concentration and PPO activity and the development of IB. The results suggest that GA and ABA are associated with IB but their roles are unclear.

Student's signature

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