Title Biochemical changes in mitochondria during chilling injury of 'Smooth Cayenne' and 'Queen' pineapples

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Abstract

Fresh pineapples could easily develop chilling injury (internal browning) symptom during exportation at low temperature. Many researchers have tried to solve this problem, but they were not successful until now. Exactly, causes of chilling injury in pineapples are still unclear. Furthermore, there were conflicts on what the real cause of chilling injury between membrane phase transition and antioxidant defense mechanisms hypotheses. Therefore, these experiments aimed to study causes of the chilling resistance of the 'Smooth Cayenne' and the chilling susceptibility of the 'Queen' pineapples and to explain chilling injury development in pineapples. We planned to investigate these two hypotheses in mitochondria. Then, we expected to know the cause of the chilling injury in pineapples and to get useful information for breeding program. 'Smooth Cayenne' and 'Queen' pineapple fruits were stored at 100°C for 0, 1, 4, 7, and 14 days to immediately determine the percentage of chilling injury. Additionally, mitochondria of 'Smooth Cayenne' and 'Queen' pineapple tissues were extracted and purified to analyze proportion of fatty acid of membrane, superoxide dismutase (SOD) activity, catalase (CAT) activity, ascorbate peroxidase (APX) activity, antioxidant capacities, and hydrogen peroxide (H_2O_2) content. We found that the percentage of chilling injury of 'Queen' pineapple increased under low temperature while no symptom in 'Smooth Cayenne' pineapple. The ratio of unsaturated fatty acids and saturated fatty acids of 'Smooth Cayenne' pineapple before storage was also higher than 'Queen' pineapple. Nevertheless, there were changes in the proportion of fatty acids of both 'Smooth Cayenne' and 'Queen' pineapples during low temperature. Activities of antioxidant enzymes (as SOD, CAT, and APX), including the antioxidant capacities in 'Smooth Cayenne' pineapple before storage were higher than 'Queen' pineapple. However, there were changes with various patterns of them during low temperature. However, the difference and changes of the H_2O_2 content between 'Smooth Cayenne' and 'Queen' pineapples during low temperature were varied. We conclude that the antioxidant system of 'Smooth Cayenne' pineapple before storage were more advantageous to chilling resistance than 'Queen' pineapple.