# Development of Predictive Model for the Remaining Shelf-life of Minimally Processed Fruit in Cold Chain: Illustrated by the Fresh-cut Pineapple

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## Outline



## Abstract

Improper temperature management during the supply chain is among other factors that can accelerate the deterioration of fresh produces. By practicing good cold chain management, the quality deterioration rate can be reduced and the shelf-life of perishable food products could be preserved. The demand for minimally processed fruits have increased in recent years as they provide great convenience, freshness, and nutrition. However, these products represent an important challenge to the postharvest sector due to the difficulty in preserving their nutritional and sensory quality, especially during distribution. Towards this, quality changes model for minimally processed fruits is needed in order to evaluate the impact of temperature abuse and propose preventative measures in the food cold chain. Therefore, we aim to develop a predictive model for the remaining shelf-life of fresh-cut fruit by investigating its quality deterioration rate under different storage temperature conditions. This study was illustrated by the fresh-cut pineapple. The storage experiments were conducted under three experimental groups: S1 (isothermal temperature: 5℃, 10℃, 15℃, 20℃ and 25℃), S2 (non-isothermal temperature: effective temperature, $T_{eff}$ = 16.2℃) and S3 (simulation of real-life cases). The quality deterioration analyses of samples were performed, including microbiological, vitamin C content, color change, moisture content, water activity, texture analysis, and sensory evaluation. The shelf-life predictive model was developed based on the significant indicators according to the quality deterioration analysis under S1 conditions and validated under S2, then applied in S3 conditions. The temperature dependence of quality deterioration was modelled by Arrhenius model and activation energy values 56.78 kJ $mol^{-1}$ for microbial growth was calculated. The shelf-life at reference temperature of 5˚C was estimated to be 7.10 day from the microbial growth basis. Activation energy for color change were ranged between 56.78 to 80.51 kJ $mol^{-1}$, whereas for texture analysis was 16.86 kJ $mol^{-1}$. An effective remaining shelf-life predictive model is developed to estimate the impacts of temperature abuse on quality changes for the fresh-cut pineapple. This research may support the temperature management in the fresh-cut fruits supply chain for improving the shelf-life control.

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