

ENZYMATIC BROWNING IN *ARTOCARPUS ODORATISSIMUS* (TERAP) AND ITS INHIBITION TREATMENTS UNDER COLD STORAGE CONDITION

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Browning is a significant limitation in the food industry, primarily caused by enzymatic activity that escalates in response to tissue stress, negatively affecting both the cosmetic appearance of products and consumer preferences. *Artocarpus odoratissimus*, a popular indigenous fruit of Sarawak, is a climacteric fruit that remains underutilized due to its short shelf life and high perishability, which result in pronounced tissue softening and browning. Notably, there is a significant lack of research on browning mechanisms and pre-treatments to mitigate this issue, which could help extend the shelf life of *A. odoratissimus*. Therefore, this study aims to assess the extent of browning and its associated enzymatic activity in *A. odoratissimus* fruit during storage, as well as evaluate the effectiveness of various anti-browning agents in controlling enzymatic browning and preserving the phytochemical properties under cold storage at 4°C. The mature fruits were harvested and stored at ambient temperature (25°C) prior to analysis. Observations revealed that *A. odoratissimus* fruits stored at 25°C began to show surface browning by day 4, which progressed to dark browning and deterioration by day 8. The browning degree in the ripened fruits was initially 0.37 ± 0.01 , increasing slightly by day 4 (0.41 ± 0.02) and further by day 8 (0.47 ± 0.01). A strong correlation was found between the degree of browning and the activity of browning-related enzymes, specifically phenylalanine ammonia-lyase (PAL) ($R^2=0.859$) and polyphenol oxidase (PPO) ($R^2=0.858$). Treatment 3 also exhibited minimal total colour changes (ΔE) at 12.91 ± 0.79 and suppressed the activity of key enzymes involved in browning, including phenylalanine ammonia-lyase (PAL), polyphenol oxidase (PPO), and peroxidase (POD), after 4 weeks of storage. The phytochemical content, particularly ascorbic acid ($18.08 \pm 1.31 \mu\text{g g}^{-1}$) and total phenolic content (TPC) ($36.83 \pm 0.20 \mu\text{g GAE g}^{-1}$), remained higher throughout the storage period. These findings underscore the efficacy of the ascorbic acid + citric acid + calcium chloride combination as a promising preservation treatment for *A. odoratissimus* fruit, thus extending its shelf life. This research lays essential groundwork for mitigating browning in *A. odoratissimus* fruit, facilitating its commercialization as a fresh-cut product.

Keywords: anti-browning; enzymatic browning, indigenous fruit, shelf life, storage, terap