

## Physicochemical Properties and Thermal Inactivation of Polyphenol Oxidase of African Bush Mango (*Irvingia Gabonensis*) Fruit

**Authors :** Catherine Joke Adeseke

**Abstract :** Enzymatic browning is an economically important disorder that degrades organoleptic properties and prevent the consumer from purchasing fresh fruit and vegetables. Prevention and control of enzymatic browning in fruit and its product is imperative. Therefore, this study sought to investigate the catalytic effect of polyphenol oxidase (PPO) in the adverse browning of African bush mango (*Irvingia gabonensis*) fruit peel and pulp. PPO was isolated and purified, and its physicochemical properties, such as the effect of pH with SDS, temperature, and thermodynamic studies, which invariably led to thermal inactivation of purified PPO at 80 °C, were evaluated. The pH and temperature optima of PPO were found at 7.0 and 50, respectively. There was a gradual increase in the activity of PPO as the pH increases. However, the enzyme exhibited a higher activity at neutral pH 7.0, while enzymatic inhibition was observed at acidic region, pH 2.0. The presence of SDS at pH 5.0 downward was found to inhibit the activity of PPO from the peel and pulp of *I. gabonensis*. The average value of enthalpy ( $\Delta H$ ), entropy ( $\Delta S$ ), and Gibbs free energy ( $\Delta G$ ) obtained at 20 min of incubation and temperature 30 - 80 °C were respectively 39.93 kJ.mol<sup>-1</sup>, 431.57 J.mol<sup>-1</sup>.K<sup>-1</sup> and -107.99 kJ.mol<sup>-1</sup> for peel PPO, and 37.92 kJ.mol<sup>-1</sup>, -442.51J.mol<sup>-1</sup>.K<sup>-1</sup>, and -107.22 kJ.mol<sup>-1</sup> for pulp PPO. Thermal inactivation of PPO from *I. gabonensis* exhibited a reduction in catalytic activity as the temperature and duration of heat inactivation increases using catechol, reflected by an increment in k value. The half-life of PPO ( $t_{1/2}$ ) decreases as the incubation temperature increases due to the instability of the enzyme at high temperatures and was higher in pulp than peel. Both D and Z values decrease with increase in temperature. The information from this study suggests processing parameters for controlling PPO in the potential industrial application of *I. gabonensis* fruit in order to prolong the shelf-life of this fruit for maximum utilization.

**Keywords :** enzymatic, browning, characterization, activity

**Conference Title :** ICBES 2023 : International Conference on Biotechnology and Enzyme Science

**Conference Location :** London, United Kingdom

**Conference Dates :** May 15-16, 2023