Kinetic modeling on quality parameters of raw Kelulut honey during dehydration process

ABSTRACT

Aims: The kinetics of Kelulut honey quality parameters of hydroxymethylfurfural (HMF), color intensity and total phenolic content (TPC) at dehydration temperatures of 40, 55, and 70°C up to 84 h were studied. Methods: Data were fitted to zero-, first-, and second-order kinetic models and regression analysis were performed to calculate rate constant and activation energy. Result: HMF increased following zero- and first-order kinetics for 40 and 55°C, respectively. However, at 70°C, HMF first increased following zero-order kinetics, peaked at 60 h and then decreased following first-order kinetics. The color intensity of honey increased with dehydration time and was adequately described by zero-order kinetics. The increase of TPC at lower dehydration temperature of 40 and 55°C followed zero-order kinetics but at higher temperature of 70°C, was better fitted with first-order model. Conclusions: The rate constants for all quality parameters increased with dehydration temperature, indicating that changes were more evident at higher temperature. The increase of TPC was found to be more evident due to its lower activation energy of 54.79 kJ/mol as compared to 104.1 and 63.16 kJ/mol for the increase of HMF and color intensity, respectively.