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Comprehensive Assessment of Physicochemical Characteristics, Mineral Content, and Antioxidant Capacity of Malaysian Kelulut and Tualang Honeys

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Abstract

Honey provides both nutritional and therapeutic benefits, making it important to evaluate its quality to ensure safe and effective consumption. The present work intended to examine the physicochemical properties, mineral composition, and antioxidant capacity of Kelulut and Tualang honeys, obtained from different regions in Malaysia. Kelulut honey was collected from Kedah (KH1) and Kelantan (KH2), whereas wild (TUW) and farmed (TUF) Tualang honey were collected from the state of Pahang, Malaysia. These honeys are unique due to their distinct floral sources, harvesting environments, and bee species, all of which may contribute to differences in their nutritional

composition, bioactive compounds, and therapeutic potential. Findings revealed that KH1 had the highest dietary fiber (0.612 ± 0.027 g/100g) and carotenoid content (13.324 ± 0.778 μ g BC/100g), while KH2 had greater moisture (30.586 ± 0.109 g/100g) and ash content (0.766 ± 0.010 g/100g). The concentration of protein in TUW was the highest with the value of 1.776 ± 0.040 g/100g, whereas TUF recorded 79.980 ± 0.280 g/100g of carbohydrate level, which was the highest among the samples. TUW was richer in fructose (33.500 ± 3.473), while KH1 contained the most glucose (40.983 ± 0.941 g/100g). KH2 exhibited the highest concentrations of calcium, magnesium, and potassium among the samples analyzed, while KH1 showed the lowest pH, indicating higher acidity. KH2 also exhibited the highest electrical conductivity and colour intensity, whereas TUW had the lowest water activity and TUF recorded the highest total soluble solid. Overall, although each honey sample exhibited distinct nutritional and physicochemical characteristics, KH2 demonstrated the most prominent quality attributes, including superior mineral composition and physicochemical properties, particularly reflected in its elevated phenolic (33.711 ± 0.590 mg GAE/100 g) and flavonoid contents (2.217 ± 0.126 mg CE/100 g), highlighting its potential as a nutritionally valuable honey with enhanced antioxidant capacity and health-promoting properties. © 2026 The Author(s). Published by Enviro Research Publishers.

Author keywords

Kelulut, Phenolics; Phytochemicals; Sugar Profile; Tualang

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