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Melissopalynological, Physicochemical properties, Multi-Element Content, and Volatile Organic Compound Profiling of Nigerian Honey (*Apis mellifera* L.): A Tool for Authenticity and Adulteration Detection

Okwong J. Walter^{1,2*}, Zainab O. Ibrahim¹

¹Department of Botany, Faculty of Science, University of Lagos, Akoka, Lagos, Nigeria

²TETFUND Center of Excellence in Biodiversity Conservation and Ecosystem Management, Nigeria

Abstract

Adequate knowledge of the flora of honeybees is important for beekeeping. This study aimed to assess the roles of pollen grains, nectar, and volatile organic compounds in the authenticity of honey samples. Six samples were collected from different regions of Nigeria and analyzed for pollen and spore content, proximate composition, heavy metal content, and volatile organic compounds (VOCs). A total of 24,481 pollen grains and spores were identified, representing 38 different plant types and 22 plant families. Notable pollen types included *Terminalia catappa*, *Vitex doniana*, *Brachystegia* sp., *Nauclea* sp., *Protea* sp., *Hagenia abyssinica*, *Albizia zygia*, *Parkia biglobosa*, *Senna* sp., and *Tridax procumbens*. The honey samples were found to be multifloral, derived from various plant species, except for Kabba and Owo. The Heavy metal analysis revealed variations in the samples, with five elements being detected Cu, Zn, Cd, Mn, and Pb. A total of 166 VOCs including alcohols, aldehydes, ketones, esters, terpenes, furans, and lactones, were detected. These compounds serve as floral markers and contribute to the distinct aromas of each honey variant. This study provides information on the botanical origins of honey samples, as well as their degree of contamination and overall purity. This information can help consumers make informed decisions when purchasing honey. Additionally, it can help regulatory agencies take appropriate measures for environmental and consumer protection, as heavy metal concentrations in honey are influenced by environmental pollution.

Key Words: Honey; Pollen; Proximate; Volatile Organic Compound; Multi-Element; Physicochemical

