

CHEMOMETRIC QUALITY ASSESSMENT OF COLOMBIAN HONEYS BASED ON PHYSICOCHEMICAL PARAMETERS AND SENSORY ATTRIBUTES

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REMARKS

Physicochemical properties of honey refer to quantifiable physical and chemical attributes that are critical for determining its quality, safety, stability, authenticity, and compliance with international standards (such as Codex Alimentarius or EU regulations). Honey sensory analysis evaluates its intrinsic properties by integrating visual, olfactory, gustatory, and tactile perceptions. Specialized receptors detect stimuli, convert them into neural signals, and transmit them to the brain, where color, aroma, taste, texture, and mouthfeel are processed



The honey sensory process provides a structured evaluation of its organoleptic qualities. The profile is assessed through vision, olfaction, and taste: vision reveals color and appearance, olfaction detects volatile compounds that define aroma, and taste identifies basic sensations. Flavor, mainly driven by aroma in combination with taste, creates a complex profile that can also help detect adulteration, as atypical attributes may indicate fraud or loss of authenticity.



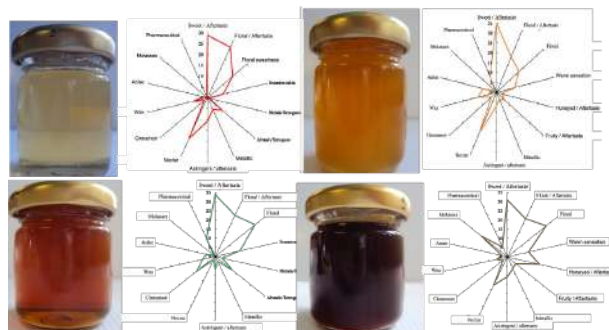
Floral honeys are generally amber in color, although darker products are also known, as is the case with honeydew honeys from Oak (*Quercus* sp.) and Ulmo (*Quillaja saponaria*). Additionally, the color has been attributed to the mineral content of the samples and the presence of tyrosine and tryptophan, which are generally absent in light-colored honeys. The quality and color tones of different types of honey are influenced by seasonal periods.

MATERIALS AND METHODS

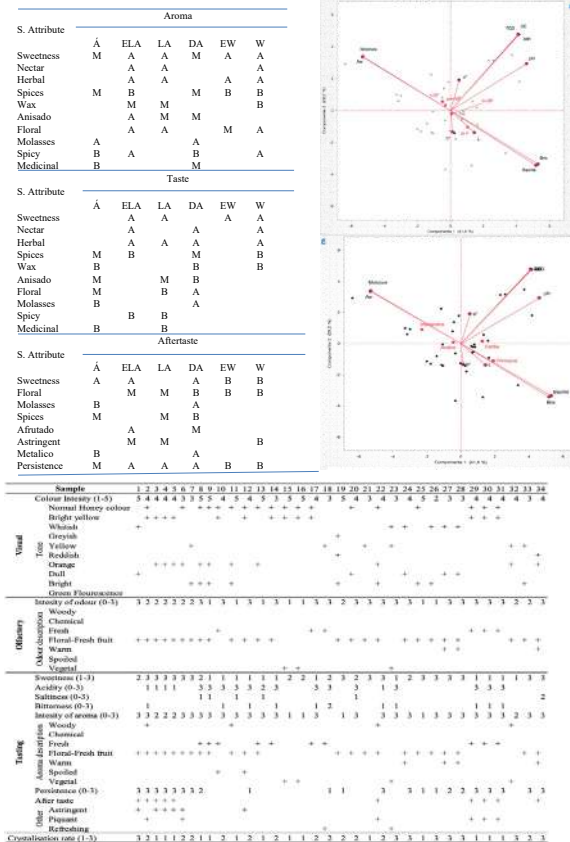
Thirty-four honey samples from *Apis mellifera* and *Melipona* spp., collected from different regions of Colombia, were provided by local beekeepers. Their physicochemical properties were analyzed, including moisture, electrical conductivity, pH, free acidity, color (Pfund scale), °Brix, °Baumé, ash content, and water activity. All analyses followed the official methods established by the International Honey Commission. Principal Component Analysis (PCA) was applied to explore relationships between variables (physicochemical properties) and samples. Sensory properties were assessed according to National Honey Board™ guidelines, and statistical analyses were performed using JMP software.

RESULTS AND DISCUSSION

Colombian honey is renowned for its rich diversity of flavors and aromas, largely influenced by the country's varied flora and geography. The honey is typically classified by color, which ranges from very light to dark amber



White: Extremely light in color with delicate floral notes. Often mild and sweet with a subtle aroma. **Extra Light:** Pale gold with a gentle sweetness and soft, floral fragrance. **Light Amber:** Light amber in color with a balanced sweetness and mild fruity or floral undertones. **Amber:** Richer golden-brown hues, offering deeper flavors with hints of caramel, nectar, and gentle spice notes. **Dark Amber:** Dark and intense in color, with strong, robust flavors, sometimes with malty, herbal, or slightly earthy notes.



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Physicochemical properties refer to measurable, physical, and chemical characteristics of honey that affect its quality, stability, and authenticity, and sensory analysis involves evaluating honey through human senses, mainly taste, smell, and texture. It is essential for assessing the overall quality and consumer preference. The aim of this study was to assess the physicochemical properties, attributes, and characteristics of Colombian honey, sourced from *Apis mellifera* and *Melipona* species, collected from various biogeographic regions across Colombia. In accordance with the international standards set by the International Honey Commission (IHC), the following variables were measured in 34 honey samples: moisture, water activity (aw), pH, °Brix, total ionic solids (TCD, ppt), electrical conductivity (EC), density, refractive index, and ash content. Chromatic characteristics were determined using the CIELab system, and color was evaluated using the Pfund scale (mm). Principal Component Analysis (PCA) was performed on the physicochemical parameters to analyze the relationships between different groups of variables. Sensory evaluation was conducted through quantitative descriptive analysis (QDA™) and hedonic classification methods from the National Honey Board. 34 honey samples (from *Apis mellifera* and *Melipona* species) were provided by beekeepers from different regions of Colombia. The physicochemical properties were analyzed according to the methods established by the International Honey Commission, including measurements of moisture, conductivity, pH, free acidity, color (Pfund scale), °Brix, °Baumé, ash content, and water activity. Sensory properties were evaluated using the National Honey Board's guidelines. The physicochemical and sensory evaluation of honey ensures its quality and authenticity, facilitates its differentiation in the market, supports biodiversity conservation, optimizes production processes, and enhances the consumer experience. Furthermore, it provides valuable tools for certification and compliance with international standards, which are essential for the competitiveness and growth of the beekeeping industry.