

Área:ANA

Chemical Composition and Antioxidant Activity of Blue Propolis from *Melipona quadrifasciata*

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Highlights

Chemical diversity and antioxidant capacity of *Melipona quadrifasciata* propolis vary by geography. Coastal blue propolis shows a distinct color but generally lower antioxidant activity than mixed-forest samples.

Resumo/Abstract

Blue propolis is an understudied Brazilian bee product whose bioactive composition may vary with landscape and flora. This work investigates the physicochemical profile and antioxidant capacity of blue propolis collected from *Melipona quadrifasciata* (Mandaçaia-grande) colonies across five municipalities in Paraná, Brazil: Chopinzinho (MACC), Campo Largo (JCL), Antonina (VAA and JPA), and Morretes (PAM). Hydroethanolic (70%) extracts were prepared and analyzed in triplicate. Coastal extracts (Antonina, Morretes) characteristically exhibited a blue hue (Figure 1). Total phenolics were quantified by the Folin–Ciocalteu method, total flavonoids by the AlCl₃ spectrophotometric assay, antioxidant capacity by the DPPH radical-scavenging method (Trolox calibration), and chemical signatures by FTIR and EDX. Marked geographical contrasts were observed. Total phenolics ranged from 0.88 mg/g (JPA) to 1.64 mg/g (MACC) as gallic acid equivalents. Samples from mixed-forest regions (MACC, JCL) consistently exhibited higher phenolic and flavonoid contents alongside enhanced DPPH response, while coastal samples (VAA, JPA, PAM) showed lower bioactive content and higher mineral signals by EDX. FTIR supported these trends: MACC showed intensified O–H and C=O bands and an aromatic C=C feature near 1600 cm⁻¹, consistent with phenolic enrichment, whereas coastal samples were dominated by aliphatic regions typical of waxes/lipids. EDX indicated elevated Si and Al in coastal propolis and comparatively lower inorganic content in high-activity, mixed-forest samples. Overall, the data indicate that local flora and environment govern the chemical and functional profile of *M. quadrifasciata* propolis. Propolis from mixed-forest landscapes presents the highest antioxidant potential, reinforcing its promise for applications in food, cosmetic, and pharmaceutical contexts and motivating targeted chromatographic profiling to pinpoint compounds responsible for activity.



Figure 1. Hydroethanolic (70%) extracts of *Melipona quadrifasciata* propolis from Chopinzinho (left) and Antonina (right).

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