



Evaluation of Antioxidant Activities, Phenolic Constituents and Essential Oil Composition of *Marrubium heterodon* (Benth.) Boiss. & Balansa from Turkey

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SUMMARY. This study comprises the antioxidant activities, phenolic constituents and essential oil composition of *Marrubium heterodon* (Benth.) Boiss. & Balansa, an endemic species distributed in Turkey. Essential oil was obtained by hydrodistillation from the aerial parts, and analysed by gas chromatography (GC) and GC/mass spectrometry (MS). In total, 38 components representing 86.8% of the oil were determined. The major components of the essential oil were α -pinene (17.3%), myrtenal (11.9%) and α -terpineol (5%). The phenolic composition of the aqueous, methanolic and ethyl acetate extracts were evaluated by liquid chromatography (LC)-MS/MS. The antioxidant activity of each extract was determined by using the *in vitro* 2,2-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging, 2,2'-Azino-bis-3-ethylbenzothiazoline-6-sulfonic acid (ABTS) radical cation decolorization and Copper (II) reducing antioxidant capacity (CUPRAC) assays. To the best of our knowledge, this is the first report on the antioxidant activities, phenolic constituents and essential oil composition of *M. heterodon*.

RESUMEN. Este estudio comprende las actividades antioxidantes, los componentes fenólicos y la composición de aceites esenciales de *Marrubium heterodon* (Benth.) Boiss. & Balansa, una especie endémica distribuida en Turquía. El aceite esencial se obtuvo por hidroddestilación de las partes aéreas, y se analizó por cromatografía de gases (GC) y GC/espectrometría de masas (MS). En total, se determinaron 38 componentes que representan el 86.8% del aceite. Los componentes principales del aceite esencial fueron α -pineno (17.3%), myrtenal (11.9%) y α -terpineol (5%). La composición fenólica de los extractos acuosos, metanólicos y de acetato de etilo se evaluó por cromatografía líquida (LC)-MS/MS. La actividad antioxidante de cada extracto se determinó usando la eliminación *in vitro* de radicales 2,2-difenil-2-picrilhidrazilo (DPPH), catión radical de ácido 2,2'-azino-bis-3-etilbenzotiazolina-6-sulfónico (ABTS), decoloración y ensayos de cobre (II) que reducen la capacidad antioxidante (CUPRAC). Hasta donde sabemos, este es el primer informe sobre las actividades antioxidantes, los componentes fenólicos y la composición de aceites esenciales de *M. heterodon*.

KEY WORDS: endemic, essential oil, GC-MS, Lamiaceae, LC-MS/MS, *Marrubium heterodon*.

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