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Phenolic compounds profile of macerates of different edible parts of carob tree (*Ceratonia siliqua* L.) using UPLC-ESI-Q-TOF-MS^E: Phytochemical screening and biological activities

Sabrina Djebari [a], Magdalena Wrona [b,*], Cristina Nerín [b], Ouarda Djaoudene [c], Sara Guemouni [a], Asma Boudria [a], Khodir Madani [a,c]

[a] *Laboratoire de Biomathématique, Biophysique, Biochimie et Scientométrie, Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, 06000 Bejaia, Algeria*
[b] *Universidad de Zaragoza, Departamento de Química Analítica, Instituto de Investigación en Ingeniería de Aragon (I3A), María de Luna 3, 50018 Zaragoza, Spain*
[c] *Centre de Recherche en Technologies Agroalimentaires, Route de Targa Ouzemmour, Campus Universitaire, Bejaia 06000, Algeria*

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ABSTRACT

Locust bean pulp and gum extracts were prepared, and phytochemical tests based on color reactions and chromatographic analyzes were performed. A profile of seventy-six phenolic compounds was obtained by the ultra-high performance liquid chromatography with electrospray ionization and quadrupole time-of-flight mass spectrometry. The main groups of phenolic compounds identified in the both extracts of *Ceratonia siliqua* L., were flavonoids, tannins and phenolic acids.

Moreover, carob pulp and gum extracts were tested for their antimicrobial activity using disk diffusion tests which showed sensitivity of the different strains to the analyzed extracts at a concentration of 100 mg/mL. Additionally, the antioxidant activity of *Ceratonia siliqua* L. extracts was assessed by the 2,2-diphenyl-1-picrylhydrazyl acid test, which confirmed stronger antioxidant properties in the case of the pulp extract.

To sum up, carob pulp and gum extracts present promising alternatives to synthetic additives within the medicinal industry, serving as potential antioxidant agents and preservatives that combat bacterial contamination, thereby offering a more natural approach to enhancing product safety and efficacy.

1. Introduction

Phenolic compounds are the most important bioactive secondary metabolites found in plants and fruits with potential beneficial effects on human health. Their ingestion from fruits and vegetables could allow human body to strengthen its defenses against the oxidation process which threatens cells on a daily basis [1,2]. In addition, phenolic compounds have the advantage of a very great structural diversity possessing a wide range of biological activities: antioxidant, antimicrobial, anti-inflammatory, antitumoral, anticancer, anti-lipidemic, and neuroprotective activities [1,3–6].

Recently, due to the suspicion of toxicity of many synthetic antioxidants, researchers have focused on plant extracts rich in phenolic compounds, such as flavonoids and hydroxycinnamic acids, due to their multiple apparent biological effects, including scavenging of free radicals, metal chelation and inhibition of cell proliferation [1,7].

The carob tree (*Ceratonia siliqua* L.) is a plant that belongs to the Fabaceae (legume) family. The fruits of this plant are made up of elongated, straight or curved compressed pods, of a shiny dark brown color. Moreover, the main parts of carob are the pulp (90%) and the seeds (8–10%) consisting of bark, endosperm and germ [8,9]. This tree thrives in the semi-arid growing conditions of the Mediterranean region and has an annual worldwide production of over 315.000 tons of carob products [10].

The carob tree possesses considerable potential value for the medicinal industry, owing to its unique chemical components, therapeutic properties, and health benefits that stem from its constituents. It has been shown that plant contain a high content of bioactive compounds such as flavonoids, phenolic compounds, anthocyanins, phenolic acids, as well as nutritional compounds such as sugars, essential oils,

* Corresponding author.
E-mail addresses: sabrina.djebari@univ-bejaia.dz (S. Djebari), magdalenka.wrona@gmail.com (M. Wrona), cnerin@unizar.es (C. Nerín), ouarda.djaoudene@crtaa.univ-bejaia.dz (O. Djaoudene), sara.guemouni@univ-bejaia.dz (S. Guemouni), asma.boudria@univ-bejaia.dz (A. Boudria), khodir.madani@crtaa.univ-bejaia.dz (K. Madani).

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