



Ultrasound assisted maceration with *Pistachia lentiscus* (lentisk) leaves to enhance the antioxidant activity and the oxidative stability of extra virgin olive oil

Amine Belbahi^{1,4} · Sofiane Dairi^{2,4} · Omar Aoun^{1,4} · Farid Dahmoune^{3,4} · Nabil Kadri^{3,4} · Hocine Remini^{4,7} · Mohamed Hadjadj⁵ · Jean Paul Cristol⁶ · Khodir Madani^{4,7} · Lila Boulekbache-Makhlouf⁴

Received: 25 February 2023 / Accepted: 29 May 2023 / Published online: 11 June 2023

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2023

Abstract

The development of new functional olive oils may help in prevention of chronic diseases and improving the quality of life for many consumers. This is focused on the enrichment of enrich virgin olive oil (VOO) with *Pistachia lentiscus* leaves powder using optimized ultrasound assisted maceration (UAM) to enhance antioxidant activity and its oxidative stability. For plant extract, total phenolic compounds (TPC) content, antioxidant activities assay and inhibition of copper-induced LDL oxidation have been determined. The TPC content, antioxidant capacity and oxidative stability (Rancimat test, PV, K₂₃₂ and K₂₇₀) of VOO enriched by US (US-VOO) have been evaluated and compared to those obtained by the conventional method (CM-VOO) and VOO control. Chemical tests showed that lentisk extracts exhibited a stronger scavenging effect more than chemical standards. Lentisk extracts may protect strongly LDL from oxidation and delaying the lag time for about 3.3 h compared to the control. The enriched US-VOO with optimum conditions (100% amplitude, 15% ratio and 10 min of time exposition) showed contents of 1.6, 3 and 4 times more than the control (VOO) for TPC, chlorophyll and carotenoids. The enriched oils by US and CV methods showed a DPPH inhibition percentage and reducing power 2.4 and 1.6 times more than those of VOO. During heat treatment, peroxide value, K₂₃₂ and K₂₇₀ values remained significantly lower in enriched oils than VOO control. These results demonstrate the great potential of USM and the use of natural preservation ingredient such as *P. lentiscus* leaves to improve VOO nutritional quality oxidation stability, and extend the shelf-life of olive oil.

Keywords Antioxidant compounds · Olive oil · Thermal stability · Kinetics · Quality indexes · Rancimat

✉ Amine Belbahi
amine.belbahi@univ-msila.dz; belbahi.amine@yahoo.fr

¹ Department of Microbiology and Biochemistry, Faculty of Sciences, Mohamed Boudiaf-M'sila University, M'sila, Algeria

² Département de Microbiologie Appliquée et Sciences Alimentaires, Faculté des Sciences de la Nature et de la Vie, Université de Jijel, 18000 Jijel, Algeria

³ Faculté des Sciences de la Nature et de la Vie et des Sciences de la Terre, Université de Bouira, Bouira, Algeria

⁴ Laboratoire de Biomathématiques, Biophysique, Biochimie, et Scientométrie (L3BS), Faculté des Sciences de la Nature et de la Vie, Université de Bejaia, 06000 Bejaia, Algeria

⁵ Centre de Recherche Scientifique et Technique en Analyses Physico-chimiques CRAPC, BP 384, 42004 Bou-Ismaïl, Tipaza, Algeria

⁶ Institut Universitaire de Recherche Clinique, Université Montpellier 1, UMR 204 Nutripass, 34967 Montpellier Cedex 2, France

⁷ Centre de recherche en technologie agro-alimentaire, Route de targua-ouzemour, 06000 Bejaia, Algeria