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Research article

HPLC-DAD profiles and pharmacological insights of *Onobrychis argyrea* subsp *isaurica* extracts

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ABSTRACT

Onobrychis argyrea Boiss. subsp. *Isaurica* (Fabaceae), endemic to the eastern Mediterranean region, is a poorly studied medicinal plant. This study sets out to investigate into antioxidant and inhibitory activities of *O. argyrea* extracts (ethyl acetate, methanol, and water) against key enzymes linked to diabetes (α-amylase, α-glucosidase), Alzheimer's disease (acetylcholinesterase, butyrylcholinesterase), and skin hyperpigmentation (tyrosinase). Phytochemical composition was determined by HPLC-DAD and *in silico* approach used to provide additional insight of the possible interaction of the identified phenolic compounds with the studied enzymes. The methanol extract showed potent inhibitory action against acetylcholinesterase (1.55 mg GALAE/g extract), tyrosinase (61.61 mg KAE/g extract), and glucosidase (20.17 mmol ACAE/g extract). The methanol extract of *O. argyrea* exhibited potent radical scavenging potential (126.51 mg TE/g extract for DPPH scavenging assay) and reducing capacities (311.36 and 200.70 mg TE/g extract, for CUPRAC and FRAP assays, respectively). Quercetin, apigenin, and benzoic acid were identified in significant amounts in the methanol extract of *O. argyrea*. Quercetin interacted with the catalytic pocket of glucosidase by establishing hydrogen bonds with Ser157, Ser241, Asp307, and π-π interactions with His280 and Tyr158. The observed inhibitory effects of *O. argyrea* extracts on the studied enzyme suggest that this plant could be a promising source of naturally occurring chemical compounds for the management of diabetes, Alzheimer's disease, skin hyperpigmentation disorders, as well as, oxidative stress-related complications.

1. Introduction

Blooming research and development initiatives highlight the polypharmacological potential of plant secondary metabolites for the treatment, prevention and/or management of several health complications (Hao and Xiao, 2018). Indeed, the use of herbal remedies to manage diseases predates recorded history of humanity (Mahomoodally et al., 2018). The therapeutic potential of compounds isolated from plants, was first reported by Merck in 1826 with the introduction of morphine and later by Bayer 1899 with the introduction of semi-synthetic aspirin derived from salicin isolated from *Salix alba* (Veeresham, 2012). Advances in analytical techniques have foster greater research for the development of new pharmacophores and scaffolds for designing effective agents for several diseases.

Alzheimer's disease is a severe neurodegenerative disease which is characterised by a loss of mental function (Liu et al., 2018). Apart from being a highly debilitating disease, Alzheimer's disease is associated to high care costs valued at more than $232 billion and causes a considerable emotional distress to family members (A.s. Association, 2018). The bidirectional interactions between Alzheimer's disease and diabetes have been evoked. Diabetes is believed to assist in neurodegeneration by inducing vascular changes in the brain, brain hypometabolism, β-amyloid accumulation, in turn, behavioural changes, memory disturbance, and hypothalamic dysfunction, characterised by Alzheimer's disease, influence systemic glucose metabolism (Shinohara and Sato, 2017).

The skin, having a surface area of approximately 1.5-2.0 m^2, is the largest organ of the human body and acts as a protective barrier with the external environment, protecting internal organs and maintaining homeostasis (de Silva and Tencomnao, 2018). Epidermal

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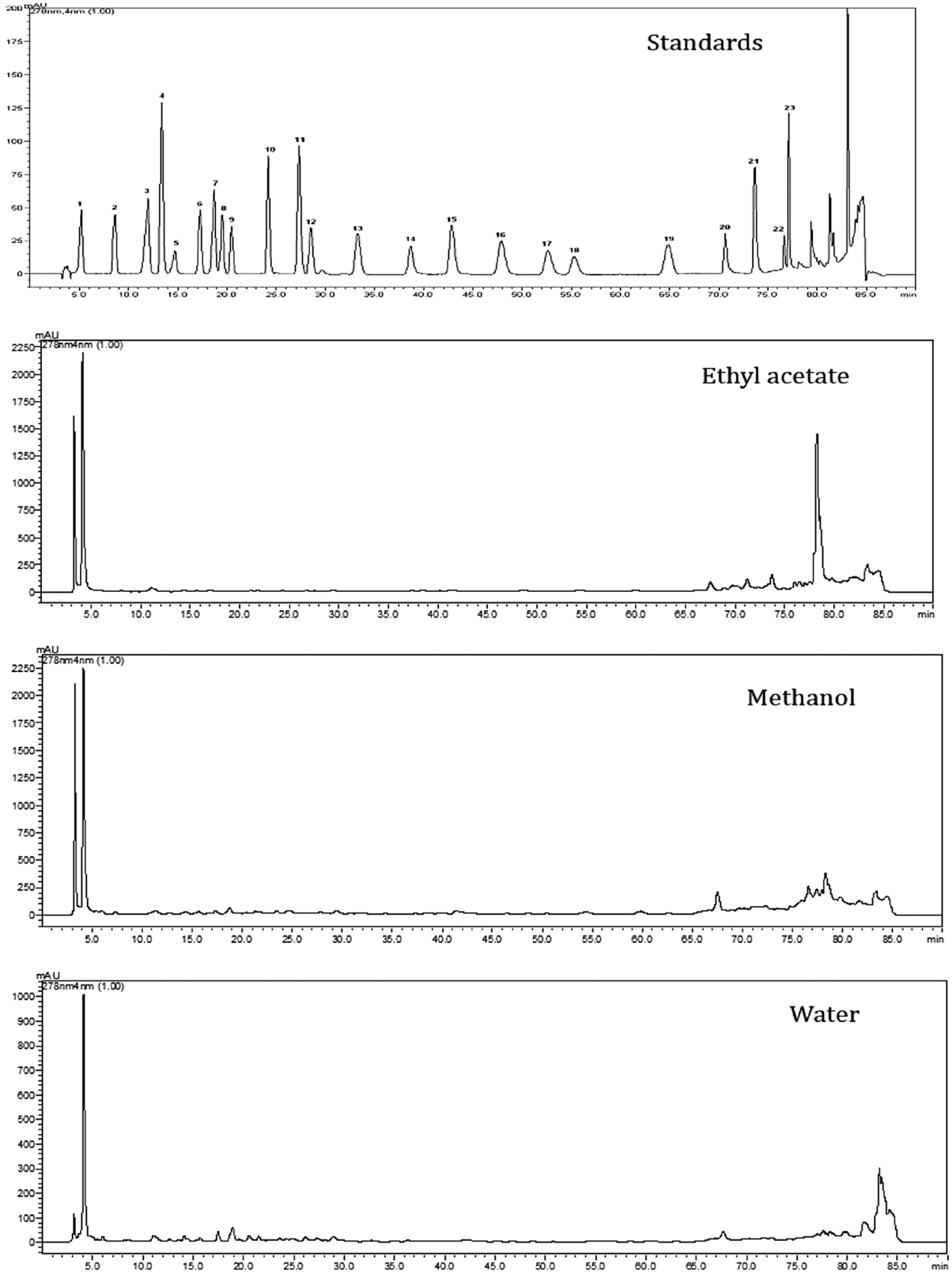

Fig. 1. HPLC chromatograms of the studied extracts (1:gallic acid, 2:protocatechuic acid, 3: (+)-catechin, 4:*p*-hydroxybenzoic acid, 5:chlorogenic acid, 6:caffeic acid, 7:epicatechin, 8:syringic acid, 9:vanilin, 10:*p*-coumaric acid, 11:ferulic acid, 12:sinapic acid, 13:benzoic acid, 14:*o*-coumaric acid, 15:rutin, 16:hesperidin, 17:rosmarinic acid, 18:eriodictyol, 19:cinnamic acid, 20:quercetin, 21:luteolin, 22:kaempferol, 23:apigenin).