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Multiple biological activities of two *Onosma* species (*O. sericea* and *O. stenoloba*) and HPLC-MS/MS characterization of their phytochemical composition

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ABSTRACT

Members of the *Onosma* genus are widely used in folk medicine and they have great interest in the pharmaceutical industry. In this study, phytochemical characterization, antioxidant activity (2,2-diphenyl-1-picrylhydrazyl (DPPH), 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS), ferric reducing antioxidant power (FRAP), cupric reducing antioxidant capacity (CUPRAC), metal chelation, and phosphomolybdenum assays), enzyme inhibition (acetylcholinesterase (AChE), butyrylcholinesterase (BChE), α-amylase, α-glucosidase, and tyrosinase), antimicrobial activity (microdilution method), genotoxic and antigenotoxic (by using *Drosophila melanogaster* larvae and Comet assay) potentials of *Onosma sericea* Willd. and *Onosma stenoloba* Hausskn. ex Riedl. were investigated. Additionally, the bioactive compounds were identified by high performance liquid chromatography-mass spectrometry/mass spectrometry (HPLC-MS/MS) analysis. Generally, *O. sericea* showed stronger antioxidant activity, while *O. stenoloba* extract exhibited stronger enzyme inhibitory abilities (cholinesterases and α-amylase). The protective effects of extracts, at the concentration range from 25 to 400 μg/mL, against hydroxyl radical-induced DNA damage were dose-dependent, increasing with a higher dosage. The extracts at the highest concentration (80 mg/mL) showed the absence of genotoxicity *in vivo*. Antigenotoxic effects were evident after treatment with both extracts, with a percentage reduction of over 80 %. Overall antimicrobial activity of studied extracts was weak, with the lowest minimal inhibitory concentration values (MIC) of 2.5 mg/mL. Taken together, obtained results showed that tested *Onosma* species can be considered as promising sources of bioactive phytochemicals for pharmacological purposes.

1. Introduction

A variety of plant species have been known as an important source of therapeutics. Since the antique ages, people have used traditional herbal medicine to treat many diseases (Cragg and Newman, 2013). The great chemical diversity of natural products from medicinal plants provides a basis for discovering the right targets which underlying various diseases. Within this context, plant species used in folk medicine are also largely studied in order to find new molecular entities derived from natural products and to struggle global health challenges such as cancer, Alzheimer disease, and diabetes mellitus (David et al., 2015; Mahomoodally et al., 2018; Zengin et al., 2018).

The genus *Onosma* belongs to the family Boraginaceae and contains more than 180 species distributed worldwide (Binzet and Eren, 2018; Cecchi et al., 2016). According to Binzet and Eren (2018), the genus includes 102 species, 59 of these are endemic to Turkey. The *Onosma* species are traditionally used in the treatment of blood disease, abdominal pain, bladder pain, burns, wounds, rheumatism, kidney irritation, strangury, fever, and as laxative, diuretic, anthelmintic, cooling, and astringent agents (Kumar et al., 2013; Mašković et al., 2015; Sarikurkcu et al., 2018). In Turkey, the plants from this genus are also used for wound healing, edema, and hemorrhoids (Altundag and Ozturk, 2011; Çakılcıoğlu and Türkoğlu, 2007; Tetik et al., 2013). However, to the best of our knowledge, the biopharmaceutical

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