



Chemical composition, antioxidant activity and acetylcholinesterase inhibitory of wild *Mentha* species from northeastern Algeria

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ABSTRACT

The aim of this work is to evaluate the chemical composition and biological activities of essential oils obtained from aerial parts of six wild Algerian *Mentha* species (*M. aquatica*, *M. arvensis*, *M. x piperita*, *M. pulegium*, *M. rotundifolia* and *M. x villosa*), collected from the National Park of El-Kala. Chemical composition was analyzed by GC-MS, the DPPH, β -carotene bleaching and ion chelating assays were carried to assess the antioxidant activity, the Ellman method were used to determine the inhibition of acetylcholinesterase. Essential oil yields and compositions varied among species. The highest yield of oils (1.8%) recorded for *M. pulegium*. 27 compounds were identified with the predominance of oxygenated monoterpenes such as menthofurane (73.38%), rotundifolone (65.99%), pulegone (59.12%), α menthol (49.89%), menthone (20.84%), neomenthol (20.76%), 1.8-cineole (18.16%). *M. aquatica* and *M. arvensis* exhibited the strongest DPPH radical scavenging activity ($IC_{50} = 0.69 \pm 0.06$ mg/ml and 0.76 ± 0.20 mg/ml, respectively) and the highest capacity to prevent β -carotene bleaching ($IC_{50} = 0.16 \pm 0.02$ mg/ml and 0.22 ± 0.01 mg/ml, respectively). The uppermost ferrous ion chelating activity was observed for *M. aquatica*, *M. arvensis* and *M. villosa* ($1.72 < IC_{50} < 1.73$ mg/ml). Whereas essential oil of *M. arvensis* was found to be the most efficient ($IC_{50} = 27.5$ μ g/ml) against acetylcholinesterase. Consequently, essential oils of *Mentha* species could be exploited for their pharmacological application in order to prevent induced diseases relied to oxidative stress.

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1. Introduction

The genus *Mentha*, belonging to *Lamiaceae* family, includes 61 species belonging to four sections (*Pulegium*, *Tubulosae*, *Eriodontes*, and *Mentha*) that are spread all over the world, especially in temperate and sub-temperate regions (Šarić-Kundalić et al., 2009). Natural interspecific hybridization is observed with high frequency both in cultivation and in wild population of *Mentha* species (Smolik et al., 2007).

Many species of mints have substantial interest due to their good flavor and appreciated oil, which represent one of the most important essential oil crops. They are used in traditional medicinal treatments as herbal remedies, food additives and taste enhancers for their olfactory properties (Dorman et al., 2003).

Mentha genus, which common name in Algeria is “Naânaâ”, has large utilization in cooking and folk medicine. Infusion, decoction and hydrolat of the aerial parts of various *Mentha* species have been used for centuries as tonics, carminative, digestive, stomachic, antispasmodic,

and anti-inflammatory agents in Algerian folk medicine (Brahmi et al., 2016a).

Recently, studies on the chemical composition, antimicrobial, antioxidant and insecticidal activities of *Mentha pulegium*, *Mentha rotundifolia* and *Mentha spicata* (Brahmi et al., 2016a, 2016b) collected from Bejaia (Northern Algeria), in the semi-humid climate, have been done. Moreover, the methanol extracts of *Mentha* species evaluated previously showed considerable antioxidant levels correlated to the strong polyphenol content (Benabdallah et al., 2016).

Effective results on the acetylcholinesterase inhibitory ability by essential oils of *Mentha* species have been reported (Mata et al., 2007; de Sousa Barros et al., 2015). Whereas, there is no previous report on the acetylcholinesterase inhibitory of Algerian *Mentha* species.

Mentha species are widely used by native habitants of El-Tarf region, situated in the extreme northeastern of Algeria, as condiment, flavor or herb in culinary preparations but also used for therapeutic properties as carminative, sedative, antispasmodic and well known to treat stomach pain. Despite ongoing research on mints, the presence of six wild *Mentha* species has not been reported previously, neither in the National Park of El-Kala (NPEK, El-Tarf region) nor in Algeria. Therefore, the interest of this study was to compare the oil composition of six

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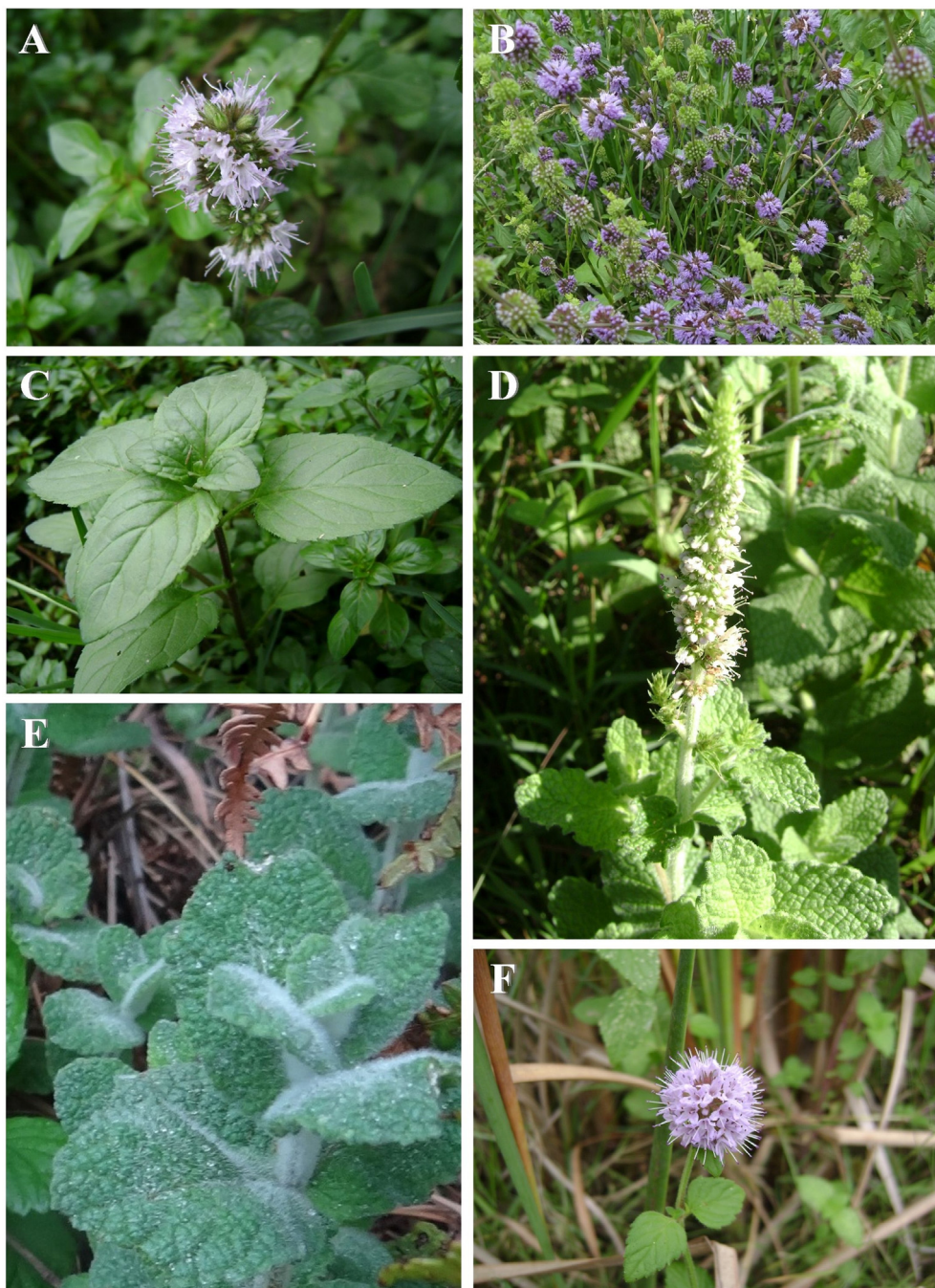


Fig. 1. Algerian *Mentha* species. A: *M. arvensis*/B: *M. pulegium*/C: *M. x piperita*/D: *M. rotundifolia*/E: *M. x villosa*/F: *M. aquatica*.

Mentha species (Fig. 1) growing wild in the North-East of Algeria (El Tarf), then to evaluate their antioxidant and acetylcholinesterase inhibitory activities. This study constitutes a tool for a better valorization of these wild species as important medicinal herbs to improve their conservation.

2. Materials and methods

2.1. Plant material

For each species, aerial parts of twenty plants were harvested at their flowering stage and sampled from the National Park of El-Kala, situated in North-East Algeria (El Tarf region, 36°49'N 8°25'/Rainfall:

910–1200 mm per year). Before analyses, aerial parts were air-dried at room temperature for 2 weeks.

2.2. Essential oil Extraction and analysis

For each species, aerial parts were ground then submitted to hydrodistillation for 3 h using a Clevenger-type apparatus; the obtained oils were dried with anhydrous sodium sulphate and then stored at 4 °C until analyses (Belhattab et al., 2014). The essential oil composition was determined by GC–MS analyses following the methods of Messaoud and Boussaid (2011), essential oil components were identified by comparison of their retention indices determined with reference to a homologous series of C₉–C₂₄ n-alkanes and with those of authentic

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