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Essential oil of *Apium nodiflorum* (L.) Lag. growing in Ksob River, Algeria

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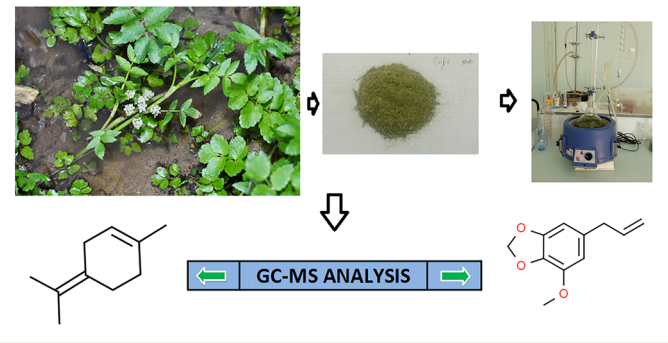
ABSTRACT

The essential oil from the aerial parts of *Apium nodiflorum* (L.) Lag. (Apiaceae), collected in Ksob River (Algeria) and obtained by hydrodistillation, was analysed by GC-MS. Sixty-seven components have been identified, representing more than 98.7% of the total oil. The essential oil was found to be rich in terpinolene (32.9 ± 4.6%), myristicin (10.6 ± 2.3%), myrcene (6.2 ± 1.1%), limonene (6.0 ± 0.9%), γ-terpinene (5.9 ± 1.2%) and (*Z*)-caryophyllene (5.3 ± 1.0%).



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Aquatic plant; *Apium nodiflorum* (L.) Lag; essential oil; GC-MS analysis

1. Introduction

Apium nodiflorum (L.) Lag., belonging to the Apiaceae family, is a perennial hydrophytic, thick stem, decumbent; leaves pinnately shaped with 9 segments (at most) oval, crenate; inflorescences in an umbel of 6 to 8 rays; involucre with many lanceolate membranous bracts. Mediterranean species, known throughout northern Algeria: in humid places, near springs, streams and lakes (Baba Aissa 1999). Known as the fool's

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water-cress, and, also called in Algeria and Morocco under the name of *Ziyata* (Baba Aissa 1999). It is distributed in central and southern Europe, western Asia and northern Africa (Tela-botanica.org. 2023).

In Algeria, the traditional use of the plant is unknown, but in other traditional systems of medicine *A. nodiflorum* is considered as tonic (Atzei 2003), laxative (Viegi et al. 2001), such as a remedy for arthritis (El Beyrouthy et al. 2008), as a stomach-ache (Tammaro 1985; Guarrera 2006), a remedy for dysfunctions of the gastrointestinal, respiratory tract, depurative for the treatment of cough and inflammation (Vlyssides et al. 2005). In the traditional veterinary medicine the plant was used to eradicate parasites (Viegi et al. 2001) and postpartum disorders (Vlyssides et al. 2005). In addition, *A. nodiflorum* has been regarded also as an antipolluting plant being capable of removing several heavy metals from aqueous solutions (Vlyssides et al. 2005). This study reports the essential oil composition of *A. nodiflorum* from Ksob River, Algeria, that is the first phytochemical report on a plant population growing in this country.

2. Results and discussion

The yield of volatile oil of *A. nodiflorum* obtained by hydrodistillation of the finely powdered aerial parts was 0.04% (v/w). Table S1 lists the chemical composition of the *A. nodiflorum* essential oil. In total, sixty-seven volatile components were identified in all the samples analysed, accounting for 98.7% of the whole compositions. The GC/MS chromatogram of the oil revealed the presence of monoterpene hydrocarbons (56.4%), sesquiterpene hydrocarbons (18.9%), phenylpropanoids (10.6%), diterpenoids (6.8%), oxygenated monoterpenes (2.4%), oxygenated sesquiterpenes (1.6%) and (1.9%) as other compounds. The high constituents were terpinolene (32.9%), myristicin (10.6%), myrcene (6.2%), limonene (6.0%), γ-terpinene (5.9%), (*Z*)-caryophyllene (5.3%) and the minor constituents were germacrene D (4.7%), neophytadiene (4.2%), germacrene B (3.3%), phytol (2.6%), β-pinene (2.4%), *p*-cymene (1.6%), γ-elemene (1.2%) and pulegone (1.0%).

According to the available literature (Table 1), the hydrodistillation gave different essential oil yields (Menghini et al. 2010; Maxia et al. 2012; Maggi et al. 2018). The essential oils yield obtained from Sardinia (Italy) and Portugual, were 1.1 and 1%, respectively (Maxia et al. 2012), while our sample showed a considerably lower value (0.04%). The essential oil composition of the Algerian *A. nodiflorum* showed similarity with those reported in the literature (Table 1), although there are some peculiarities to report. In fact, (Z)-caryophyllene (5.3%) and germacrene B (3.3%) were virtually absent in the essential oils reported in previous studies (Menghini et al. 2010; Maxia et al. 2012; Heshmati Afshar et al. 2017; Benelli et al. 2017a, Benelli et al. 2017b; Maggi et al. 2018). Moreover, three compounds such as neopphytadiene (4.2%), myrcene (6.2%), and terpinolene (32.9%) were particularly abundant in the analysed sample (Table S1 and Table 1). On the other hand, β-pinene (2.4), limonene (6.2%), γ-terpinene, and myristicin (10.6%) showed lower levels than the ones in other investigated populations.

3. Experimental

See Supplementary Material.

Table 1. Major compounds in the essential oils of *Apium nodiflorum* reported in literature.

Accession	Part used	Principal components (%)	References
Pescara, Abruzzo (Italy) Wild / 0.08% / Fresh	Aerial parts	β-pinene (6.6), limonene (27.7), p-cymene (23.0), myristicin (18.5)	Menghini et al. 2010
Monte dei Sette Fratelli, Sardinia (Italy) / Wild / 1% / Dry	Aerial parts	limonene (14.4), dillapiol (70.8)	Maxia et al. 2012
Penacova (Portugal) / Wild / 1.1% / Dry		limonene (16.7), terpinolene (7.2), myristicin (29.1), dillapiol (22.5)	
Badia Morronese-Fonte d'Amore (Italy) / Wild / 0.5% / Dry	Aerial parts	limonene (7.8), (*Z*)-β-ocimene (19.0), terpinolene (7.1), germacrene D (6.0), myristicin (49.1)	Benelli et al. 2017a
Fiuminata (Italy) / Wild / 0.2% /Dry	Whole plant	limonene (39.8), γ-terpinene (6.4), myristicin (35.3)	Benelli et al. 2017b
Taverne – Colfiorito Highland (Serravalle del Chienti, Marche) (Italy) / Wild / 0.44% / Dry	Aerial parts	β–pinene (5.5), limonene (40.6), myristicin (24.3), dillapiol (9.4)	Heshmati Afshar et al. 2017
Fiume Pescara (Popoli, PE), Abruzzo región (Italy) / Wild / 0.3% / Dry	Aerial parts	β-pinene (9.0), limonene (34.2), (*Z*)-β-ocimene (5.0), myristicin (31.8)	Maggi et al. 2018
Fiuminata (MC), Marche region (Italy) / Wild / 0.2% / Dry		limonene (8.9), (*Z*)-β-ocimene (12.4), myristicin (63.4)	
Le Rote (Pieve Torina, MC), Marche region (Italy) / Wild / 0.9% / Dry		β-pinene (9.6), limonene (42.4), myristicin (32.1)	

4. Conclusion

This study reports the essential oil composition from aerial parts of *A. nodiflorum* growing in the Ksob River, Algeria. This essential oil was characterised by high content of terpinolene and myristicin. The phytochemical profile herein reported represents the first investigation of an Algerian population and showed a certain similarity with the ones previously reported in literature. A a successive step, the biological activities of the essential oil will be evaluated in order to valorise this aquatic species with a special ecological character.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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