

RESEARCH ARTICLE

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Characterization of volatile compounds of *Daucus crinitus* Desf. Headspace Solid Phase Microextraction as alternative technique to Hydrodistillation

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Abstract

Background: Traditionally, the essential oil of aromatic herbs is obtained using hydrodistillation (HD). Because the emitted volatile fraction plays a fundamental role in a plant's life, various novel techniques have been developed for its extraction from plants. Among these, headspace solid phase microextraction (HS-SPME) can be used to obtain a rapid fingerprint of a plant's headspace. *Daucus crinitus* Desf. is a wild plant that grows along the west coast of Algeria. Only a single study has dealt with the chemical composition of the aerial part oils of Algerian *D. crinitus*, in which isochavicol isobutyrate (39.0%), octyl acetate (12.3%), and β -caryophyllene (5.4%) were identified. Using GC-RI and GC-MS analysis, the essential oils and the volatiles extracted from separated organs of *D. crinitus* Desf. were studied using HS-SPME.

Results: GC-RI and GC-MS analysis identified 72 and 79 components in oils extracted using HD and in the volatile fractions extracted using SPME, respectively. Two types of essential oils were produced by the plant: the root oils had aliphatic compounds as the main component (87.0%-90.1%), and the aerial part oils had phenylpropanoids as the main component (43.1%-88.6%). HS-SPME analysis showed a more precise distribution of compounds in the organs studied: oxygenated aliphatic compounds were well represented in the roots (44.3%-84.0%), hydrocarbon aliphatic compounds were in the leaves and stems (22.2%-87.9%), and phenylpropanoids were in the flowers and umbels (47.9%-64.2%). Moreover, HS-SPME allowed the occurrence of isochavicol (29.6 - 34.7%) as main component in *D. crinitus* leaves, but it was not detected in the oils, probably because of its solubility in water.

Conclusions: This study demonstrates that HD and HS-SPME modes could be complimentary extraction techniques in order to obtain the complete characterization of plant volatiles.

Background

Daucus is a genus belonging to the Apiaceae family and consists of about 600 species that are widely distributed around the world. *D. carota* (carrot) is the main species of the *Daucus* genus, and its cultivated form, *Daucus carota* ssp. *sativa*, is one of the most popular root vegetable crops in the world. Carrots have been reported to be endowed with medicinal properties, i.e., hypotensive, diuretic, carminative, stomachic, and antilipemic

properties [1-4]. In Algeria, the *Daucus* genus is represented by species living in dry and uncultivated areas and, among these, *D. crinitus* Desf. syn. and *D. meifolius* Brot. are widespread along the Algerian west coast from Tlemcen to Mascara [5]. *D. crinitus* is characterized by the presence of many subspecies that colonize the sands and cliffs [5]. A survey conducted by herbalists identified that, in folk medicine, a drink made from the roots of *D. crinitus* is used in decoction to expel the placenta after childbirth, and as a tonic.

Although the phytochemistry of the *Daucus* genus has been extensively studied (e.g., flavonoids, carotenoids, polyacetylenes, anthocyanins, and volatile constituents),

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