



Abstract

# Sea Fennel (*Crithmum maritimum* L.): A Promising Biosaline Crop. Extraction, Purification and Chemical Characterization of Polar Extracts <sup>†</sup>

Diletta Piatti <sup>1,\*</sup>, Simone Angeloni <sup>1</sup> , Giovanni Caprioli <sup>1</sup> , Filippo Maggi <sup>1</sup> , Massimo Ricciutelli <sup>1</sup>,  
Lolita Arnoldi <sup>2</sup> and Gianni Sagratini <sup>1</sup>

<sup>1</sup> Chemistry Interdisciplinary Project (CHip), School of Pharmacy, University of Camerino, Via Madonna delle Carceri, 62032 Camerino, Italy; simone.angeloni@unicam.it (S.A.); giovanni.caprioli@unicam.it (G.C.); filippo.maggi@unicam.it (F.M.); massimo.ricciutelli@unicam.it (M.R.); gianni.sagratini@unicam.it (G.S.)

<sup>2</sup> Research and Development Department, Indena SpA, Viale Ortles 12, 20139 Milan, Italy; lolita.arnoldi@indena.com

\* Correspondence: diletta.piatti@unicam.it

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*Crithmum maritimum* known by several popular names such as *finocchio marino*, *critmo*, *cretamo*, *spaccasassi*, *bacicci*, *basiggia*, *erba di San Pietro* and *salissia*, is a perennial halophyte that thrives on coastal cliffs and sometimes in sandy beaches along the Mediterranean, Pacific and Atlantic coasts. This plant, native to southern Europe, also survives under salinity conditions, so it is considered a promising biosaline crop. However, its commercial cultivation potential is not yet fully exploited and there are few studies regarding the agricultural management and best practices to grow this crop in the Mediterranean environment.

Sea fennel is also an emerging vegetable crop thanks to its increasing food uses. This is due to its aromatic traits, for instance to make pickles and to flavour and season soups, sauces and salads. The connections between cultivation and nutritional value were investigated. Since the natural environment of the sea fennel has a high concentration of iodine, a biofortification experiment was performed to evaluate the effect on nutritional values.

For the reasons mentioned above, interest in this plant is growing and different studies have been performed to understand the total chemical profile of the vegetable.

This work aimed to provide a complete quantitative and qualitative overview of the extract obtained from the aerial parts of *C. maritimum*, provided by a Mediterranean firm. For this purpose aerial parts were dried, ground and extracted by percolation with 70% ethanol at 60 °C. The purification was done using an Amberlite<sup>®</sup> XAD7HP sorbent resin, purchased from Sigma Aldrich (Milan, Italy). For the quantification, an UHPLC-DAD-MS/MS system was used, equipped with electrospray ionization (ESI) and a Zorbax ODS (250 × 4.6 mm, 5 µm) column.

The results showed that the purified extract is richer than the unpurified one, and furthermore the extract was mainly composed of phenolic compounds, among which hydroxycinnamic acids and flavonoids were the two main chemical classes. Among the former, chlorogenic acids, including 5-*O*-caffeoylquinic acid (10.5–22.36 mg g<sup>-1</sup>), 3,5-di-*O*-caffeoylquinic acid (5.99–15.82 mg g<sup>-1</sup>) and 4,5-di-*O*-caffeoylquinic acid (5.09–15.35 mg g<sup>-1</sup>), were the most abundant ones. Among flavonoids, rutin (1.60–4.33 mg g<sup>-1</sup>) and kaempferol-3-*O*-rhamnoside (0.07–0.33 mg g<sup>-1</sup>) were the main constituents.

These results support the use of this plant as a functional food or in nutraceuticals, thanks to the abundance of antioxidant compounds. This also suggests that study of the relation between cultivation systems and nutraceutical values should be done in the future.

**Supplementary Materials:** The following are available online at: <https://www.mdpi.com/article/10.3390/IECPS2021-12033/s1>.

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