



Deliverable title	D6.2 Recommendations and guidelines for preparation of crude extracts with antioxidant, antimicrobial and/or health-beneficial activity from sea fennel
Deliverable Lead:	UNIBRE
Related Work Package:	WP6
Related Task:	Task 6.1 (R&D). Preparation and analysis of extracts from sea fennel crop by-products
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Summary of Deliverable D6.2 – Guidelines for Preparation of Bioactive Extracts from Sea Fennel	Deliverable D6.2 turns the research on sea fennel bioactives into a practical protocol for extract preparation, offering clear guidelines that researchers, food technologists, and industry stakeholders can apply. The focus is on eco-friendly, food-grade methods that maximize the recovery of health-promoting compounds while complying with EU regulations. The recommended approach is to start with aerial parts of <i>Crithmum maritimum</i>, which should be freeze-dried immediately after harvest to preserve sensitive metabolites, then ground into fine powder to improve extraction efficiency. The optimal solvent is a hydroethanolic mixture (80% ethanol, 20% water), proven to yield high levels of phenolic compounds - particularly chlorogenic acids, flavonoids, and other antioxidants. Among the tested methods, Microwave-Assisted Extraction (MAE) emerged as the most effective, enabling high yields and strong antioxidant activity with short extraction times (about 5 minutes). Ultrasound-Assisted Extraction also gave good results within 30 minutes, while conventional maceration can be applied under controlled temperature and dark conditions to prevent degradation. Extraction yields typically range between 10–17%, depending on the method and plant material. Once extracted, the liquid is filtered, concentrated by Rotavapor at 40 °C, and freeze-dried for 21–23 hours, resulting in a stable powdered extract. These crude extracts have been validated for antioxidant, antimicrobial, anti-diabetic, and anti-inflammatory properties, making them suitable for potential applications in functional foods, nutraceuticals, natural preservatives, and cosmetics.

Versioning and Contribution History

Version	Date	Modified by	Modification reason
v1.0	20/08/2023	Christian Magné	First version
v2.0	30/08/2023	Christian Magné	Comments after peer reviewing process

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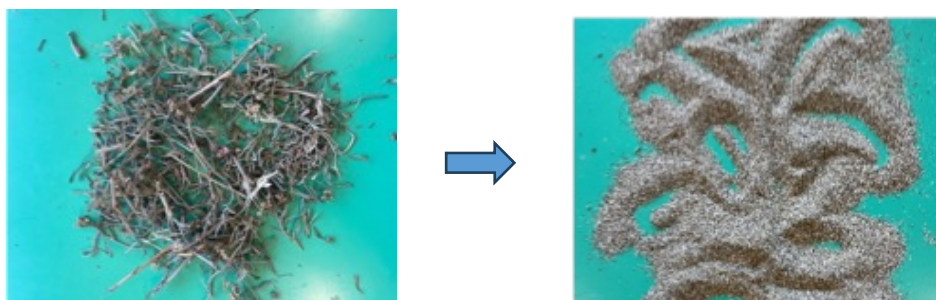
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1. Recommendations and guidelines for preparation of crude extracts with antioxidant, antimicrobial and/or health-beneficial activity from sea fennel

Sample Collection and Pre-Treatment

The aerial parts of *Crithmum maritimum* should be freeze-dried as soon as possible after harvesting to prevent degradation of sensitive secondary metabolites.

Once freeze-dried, the samples should be ground into a fine powder to increase surface area and improve the efficiency of bioactive compound extraction.



Solvent Selection and Extraction Method

A hydroethanolic solvent system (ethanol:water) is recommended to maximize extraction efficiency, especially for phenolic compounds. Ethanol concentrations between 30% and 80% have proven effective, with 80% ethanol yielding the highest extraction efficiency (~63%).

Microwave-Assisted Extraction (MAE) is preferred due to its superior ability to extract phenolic compounds and enhance antioxidant activity. Care should be taken to use moderate microwave power settings, as excessive power may degrade target compounds.

For conventional solvent extraction, an extraction temperature of 40°C is optimal. However, a temperature of 60°C combined with 80% ethanol is ideal for enriching chlorogenic acids.

Recommended Extraction Protocol

For standardized extract preparation, the following protocol is recommended:

Sample weight: 100 g of dried sea fennel powder

Solvent: 2 L (80% ethanol : 20% distilled water)

Extraction temperature: 60C

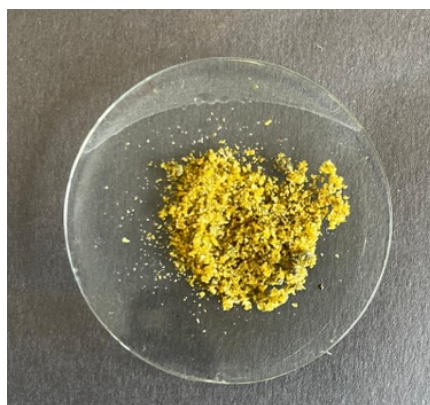
Extraction time: 5 minutes (using MAE) or 30 mins (using ultrasound)



Sea fennel powder mixed with solvent

Filtration: filter paper

Solvent evaporation: Rotavapor at 40C 2 hours



Freeze drying: 21-23 hours

Alternative maceration protocol:

Solvent-to-solid ratio: 1:1

Conditions: Perform extractions in the dark and at low temperatures to prevent phenolic degradation

Optional: Apply ultrasound or microwave co-treatment to reduce extraction time

Freeze dried hydroethanolic extract

Flow chart for preparation of hydro-ethanolic extract from sea fennel

