Reviewer 2

The manuscript explores the valorization of sea fennel by-products using aqueous and hydroethanolic extractions. The following key issues should be addressed:

1. The by-product is a heterogeneous mixture of woody parts, stems, old leaves, and flowers. However, these components were not separated or analyzed individually. Given the likely variation in phenolic and flavonoid content among materials, why were the samples not fractionated? Furthermore, how is consistency in active compound content ensured in such a mixed material?

   Answer: We appreciate the reviewer's insightful observation. As correctly noted, the by-product used in this study comprises a heterogeneous mix of plant tissues (woody stems, old leaves, and flowers), which were not analyzed separately. Our primary objective was to assess the feasibility of valorizing this by-product as it is generated from standard sea fennel cultivation and pruning practices. This approach reflects real conditions and aims to evaluate its potential application as a food-grade extract without extra cost or labor load for fractionation, thereby aligning with principles of circular economy and industrial scalability. We acknowledge that the phenolic and flavonoid contents likely vary among the individual plant parts. However, this studied matrix represents the actual composition of post-harvest residual biomass sourced from a single cultivation cycle and location, helping to reduce variability linked to environmental and agronomic factors, which they established to be causing variation in the bioactives composition of plant material.

2. Only aqueous and 80% hydroethanolic extracts were tested, despite the manuscript acknowledging that other organic solvents may show stronger antimicrobial activity. While food-grade solvents are appropriate, some low-boiling solvents can be safely used after complete drying. Why was 80% ethanol chosen specifically—was this based on prior studies or optimization?

   Answer: We thank the reviewer for the concern, our extraction strategy was intentionally designed to prioritize food-grade, GRAS (Generally Recognized As Safe), and environmentally sustainable solvents suitable for direct application in food systems. Our study presents preliminary results focused on evaluating the potential of sea fennel by-products as a source of bioactive compounds and their potential for further applications in the food industry. In future studies, we will certainly consider the findings of this work to explore and optimize alternative extraction strategies, including additional solvents or techniques that remain compliant with food safety standards.

3. The extraction protocol lacks optimization. Key parameters such as solvent concentration, temperature, and extraction time were not explored. Without optimization, it is unclear whether the extraction yield is near optimal.

As we mentioned, this study is exploratory for the potential use of sea fennel by-products and the results are preliminary for the future continuation of this work. In future studies, we will consider exploring and optimizing extraction strategies, including extraction time, additional solvents or techniques that remain compliant with food safety standards.

4. The identification of phenolic compounds via LC-MS is not sufficiently described. Were identifications based on standards, MS fragmentation patterns, or database matching? Detailed methodology is needed to assess the accuracy of compound identification.

   Answer: We appreciate the reviewer's comment, the tentative identification for the phenolic compounds was done based on retention time, absorbance spectra by PDA and mass-to-charge ratios (m/z) obtained in negative ionization mode. The detailed methodology for identification and semi-quantification of the phenolic compounds has been included in lines (166-172).

5. Figure 2 raises several concerns. For example, peak 1 appears to represent overlapping compounds, yet it is grouped as a single peak. Additionally, peaks are labeled by broad compound classes (e.g., "Caffeoylquinic acids") instead of specific chemical names. If individual compounds were identified, they should be explicitly labeled.

   Answer: We thank the reviewer for this important observation regarding Figure 2. Due to the complexity of the sample matrix and the resolution of the chromatographic conditions used, some peaks, particularly those corresponding to hydroxycinnamic acid derivatives, may indeed reflect overlapping isomers. As a result, we chose to label them under broader compound classes (e.g., "caffeoylquinic acids") to avoid over-interpretation in the absence of confirmation. Where possible, specific compound names were included in the legend of Figure 2 (Peak 2, Peak 4, Peak 6, Peak 8, Peak 9, Peak 12 and Peak 14).