Developing added-value food products from hempseeds: fractionation, characterization and novel protein-based edible films formation

A. Natsia, H. Papapostolou, A. Papadaki, and N. Kopsahelis*

Department of Food Science and Technology, Ionian University, Argostoli, 28100, Kefalonia, Greece
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Presenting author email: natsiakaterina@gmail.com
*Corresponding author email: kopsahelis@upatras.gr; kopsahelis@ionio.gr

Abstract

The demand for plant-based foods is constantly increasing, as consumers are seeking to adopt a healthier and more sustainable diet. In this context, there is a growing interest for hempseed (*Cannabis sativa* L.), as it has been reported to have beneficial effects on human health (due to its rich content in polyunsaturated fatty acids and essential amino acids). Likewise, hemp protein is a sustainable and eco-friendly source of protein, as hemp plants require less water and fewer pesticides, compared to most other crops. Additionally, hemp protein is considered an easily digestible protein. However, antinutritional compounds, including phytic acid and trypsin inhibitors, primarily found in the hulls of the seed, might interfere with the absorption of nutrients. In the view of the above, this study focused on hempseed fractionation and the subsequent exploitation of the obtained value-added streams, aiming to highlight their functionality and their perspective to formulate novel food products.

In particular, hempseeds of the Finola variety were subjected to dehulling process, resulting in 42% (w/w) hulls and 58% (w/w) shelled seeds. Hempseed hulls have been reported to be a good source of phenolic compounds. In our case, the total phenolic content of hulls was 1.15±0.09 mg GAE/ g hull, with an antioxidant activity index (DPPH) of 82.7±5.2%. In addition, HPLC-DAD analysis revealed that N-trans-caffeoyl-tytramine was the most abundant (76.13 ppm) phenolic in hempseed hulls. The dehulled seeds, after oil extraction, were used to isolate hemp protein by isoelectric precipitation. The effect of different solubilization and precipitation pH values was studied, aiming to achieve high levels of protein purity. Results showed that the highest purity level (94.5% Kjeldahl protein) was achieved at solubilization and precipitation pH values of 12 and 5, respectively. Furthermore, HPLC-DAD analysis showed L-Glutamic acid, L-Aspartic acid and L-Arginine as the main amino acids of hemp protein isolate. Thereafter, hemp protein isolate was utilized as the raw material for edible films formation. Protein-based edible films are becoming increasingly important in the food industry due to their potential to improve food safety, quality, and shelf-life. In this framework, the effect of pH and temperature, of the film casting solution, on the properties of hemp edible films was also studied. The results showed significant changes at different pH values and temperatures during the denaturation phase, thus edible films with tailor-made properties can be produced depending on the desired application.

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