Evaluation of PUFAs throughout Osmotic Shock and Bligh & Dyer applied to Antarctic macro algae *Palmaria decipiens* and *Iridaea cordata*

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Abstract

In this work, different extraction methods were compared for the determination of fatty acids from red macro algae.

Introduction

Macro algae are phosynthetic organisms, which are widely spread throughout the planet. Red macro algae (*Rodophyta*) are one of several phyla and can be found in environments like Antarctic. Survival in this habitat forces organisms to synthesize polyunsaturated fatty acids (PUFAs).[1]

PUFAs are a class of fatty acids (FA) that has a long carbon chain filled with two or more double bonds. These molecules are known for its biotechnological and medicinal potential.[2]

Since Antarctic and *Rodophyta* are an uncharted territory for potential active biomolecules this work focuses in these prospective key points. Besides, this study compares two different extraction methodologies – modified Blight & Dyer and osmotic shock – in order to find a more efficient method to extract PUFAs. Extraction impacts severally in the content of these molecules so methods must be sensitive and environmental friendly as it can be.[3,4,5]

In continuation of our program research in alternative methodologies in organic chemistry[6], *Palmaria decipiens* and *Iridaea cordata* had their FA extracted and esterified using standard - so as toxic - boron trifluoride (BF_3) and alternate less harmless Hartmann methodology.[7] A flame ionization detector gas chromatography (GC-FID) tested final results.

Results and Discusion

The FA profile from these two red macro algae revealed a wide range of polyunsaturated fatty acids like C16:0, C20:4 n6 and 20:5n3. Alternate procedures like osmotic shock that use less solvents, water and energy show itself as a promising alternative against other expandable methods. This technique lies in the formation of an osmotic pressure that disturbs algal cells so that fatty acids are extracted.[4, 8]

Notwithstanding, osmotic pressure/Hartmann as an extraction and esterification, respectively, method reduced by half the amount of solvent used compared to Bligh & Dyer/BF_3. In addition, the levels of toxicity exposure were lower. However, it had a lower range of fatty acids extracted.[4] Table 1 shows the concentration of several PUFAs found in the analysis of *Iridaea cordata*.

Table 1. Concentration of PUFAs in Blight & Dyer (BD) and osmotic shock (OS) in *Iridaea cordata*

	C20:5n3	C20:4n6	C18:2n6	C20:3n6	C18:3n3
BD	50%	5,75%	0,012%	0,009%	0,007%
OS	23,70%	7,17%	13,78%	-	-

According to [7], esterification under Hartmann conditions proved to be fairly equal to that using BF_3. Analysis of both chromatograms shows that osmotic shock almost has the same extraction potential compared to Bligh & Dyer. However, as said before, it had a lower range of fatty acids and, therefore, PUFAs. On the other hand, since this osmotic shock is an emerging method, these conditions may evolve so that it uses less energy and improves its extraction potential.

Conclusions

According to the results achieved, red macro algae from Antarctic showed a great variety and quantity of PUFAs along with other FA. Furthermore, osmotic shock proved to be a promissory methodology having a bit lower potential extraction compared to a conventional technique. However, further studies may be conducted so that potential extraction from this new method can be enhanced and evolved.

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