

Effect of pulsed electric fields (PEF) on the recovery of antioxidant protein extracts from fish side streams

Francisco J. Martí-Quijal, Francesc Ramón-Mascarell, Francisco J. Barba

Nutrition, Food Science and Toxicology Department, Faculty of Pharmacy, Universitat de València, Avda. Vicent Andrés Estellés, s/n, 46100, Burjassot, València, Spain

francisco.j.marti@uv.es (F.J.M-Q); ramas@alumni.uv.es (F.R-M); francisco.barba@uv.es (F.J.B.)

INTRODUCTION

Around 11 million tons of fish (including aquaculture) are produced in Europe. However, only 50% of this biomass is used for human consumption, rejecting a large amount of protein-rich by-products that end up being used for animal feed or directly discarded. Food supplements are also made from fish, however they are carried out with conventional methods that can reduce both their quality and their activity. In this sense, non-conventional extraction technologies are taking great relevance, since they allow a better extraction of compounds, being more respectful with the environment. Therefore, the aim of this work is to determine the influence of Pulsed Electric Fields (PEF) technology in the extraction of bioactive compounds from fish by-products.

MATERIALS AND METHODS

In order to valorise these side streams, an extraction assisted by pulsed electric fields (PEF) was carried out to obtain proteins and compounds with antioxidant activity. An extraction for the same time but without PEF pre-treatment was used as a control. The side streams used were head, skin, viscera and backbone from sea bass. The studied parameters were field strength, specific energy and time of extraction. They were optimized, and the study was carried out with the optimal conditions for each by-product (Table 1). The antioxidant capacity was measured by two complementary methods, TEAC and ORAC.

Table 1. Optimal conditions of PEF treatment for each fish side streams.

	Optimal Conditions			
	HEAD	SKIN	VISCERA	BACKBONE
Specific energy	220 kJ/kg	300 kJ/kg	300 kJ/kg	300 kJ/kg
Field strength	1 kV/cm	3 kV/cm	1 kV/cm	1 kV/cm
Time of extraction	21 h 20 min	24 h	15 h 10 min	21 h

Acknowledgements: The authors would like to acknowledge the EU Commission for the funds provided by the BBI-JU through the H2020 Project AQUABIOPROFIT “Aquaculture and agriculture biomass side stream proteins and bioactives for feed, fitness and health promoting nutritional supplements” (Grant Agreement no. 790956). Moreover, Francisco J. Martí-Quijal would like to thank the pre-PhD scholarship program of the University of Valencia, “Atracció de Talent”.

RESULTS

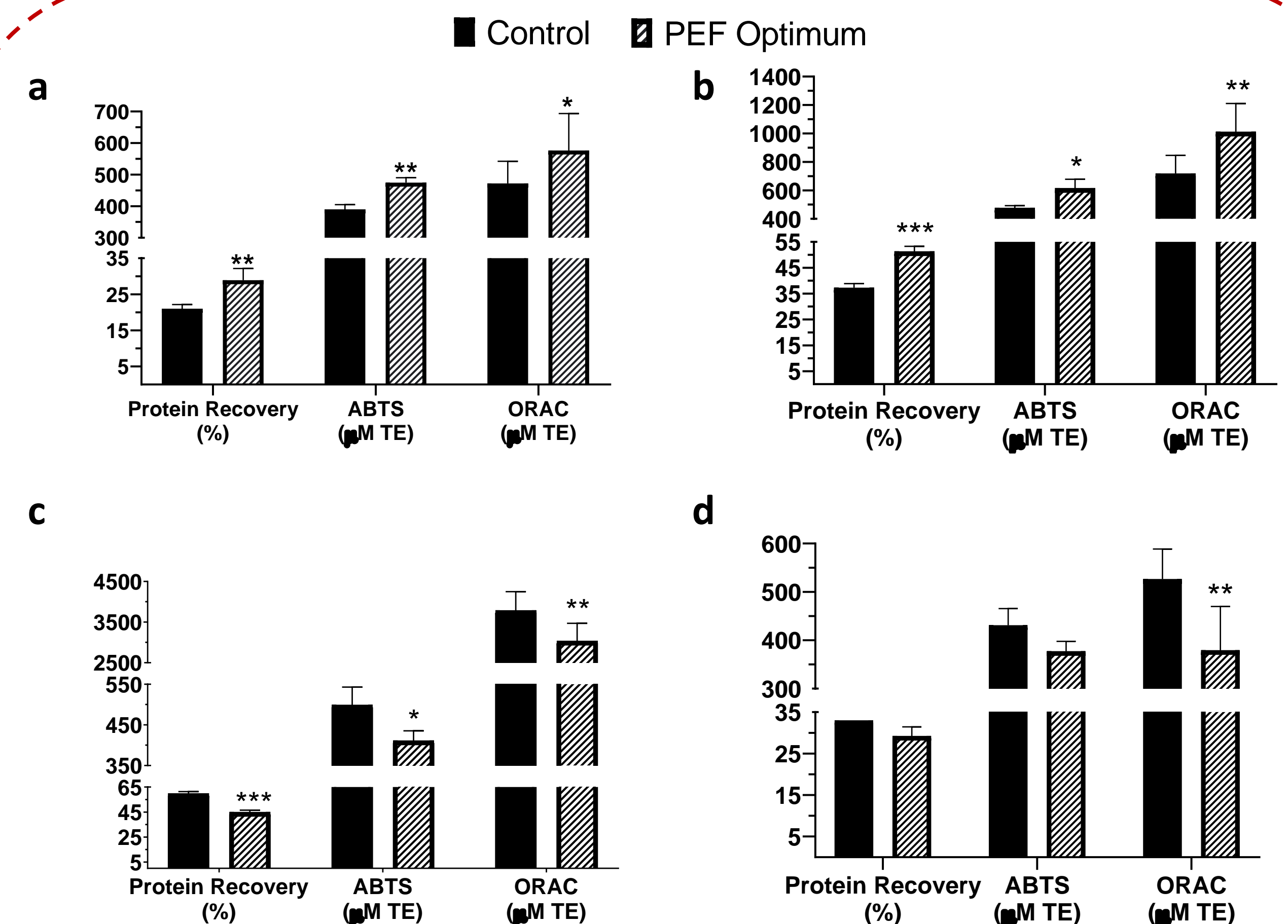


Figure 4. Comparison between PEF-pretreatment at optimal conditions and control sample at the same time of extraction for the studied by-products: a) Head, b) Skin, c) Viscera and d) Backbone. Results are expressed as mean \pm standard deviation (SD). * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

CONCLUSION

PEF-assisted extraction can be a good strategy to increase the recovery of proteins and antioxidant compounds from fish side streams like head or skin, but not for viscera and backbone.