# PULSED ELECTRIC FIELD (PEF) PRE-TREATMENT TO PROTEIN EXTRACTION FROM PORK LIVER. INFLUENCE ON TECHNOFUNCTIONAL PROPERTIES

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## I. INTRODUCTION

Pork liver is considered a high source of protein, around 20%, co-product from the meat industry. Proteins present in this organ have a great nutritional potential due to the composition in essential amino acids [1]. Furthermore, the interesting techno-functional properties of proteins could be suitable as ingredient in the developing of novel foods [2]. Thus, the recovery of pork liver proteins might be an alternative to revalorize the aforementioned co-product. The main procedure to extract proteins consists of alkaline solubilization and further precipitation at the isoelectric point. Pre-treatments using new technologies preceding the protein extraction process could improve protein extraction, as well as to enhance the techno-functional properties of the isolates inducing some modifications in their structure. Thus, the aim of this research was to analyze the feasibility of using pulsed electric field (PEF) pretreatment to improve protein extraction from pork liver and its impact on technological properties of protein isolates.

## II. MATERIALS AND METHODS

Pork liver containing 19% of protein was used as raw material. Protein isolates (PI) were extracted from pork liver by pH-shift solubilization pH=8.5) followed by acid precipitation (pH=4) and subsequently PI were freeze-dried. PEF (1 kV/cm, pulse width 25 $\mu$s and frequency 10 Hz) was applied as a pre-treatment in the raw pork liver. A Box-Benkhen experimental design (n=3) of 3 factors at 3 different levels was performed by modifying the energy applied in the PEF treatment (0-control, 50, 100 kJ/kg), solubilization temperature (20, 30, 40 °C) and solubilization time (10, 15, 20 min). As response variables, protein extraction yield, protein content and techno-functional properties of proteins (WHC-Water and OHC- Oil Holding Capacity) were analyzed.

## III. RESULTS AND DISCUSSION

Protein content in the PI was improved when PEF pre-treatment was applied. Thus, the protein content in control samples (without PEF) was significantly ($p<0.05$) lower (62.0±2.2 g/100 PI) than in PEF treated samples but the effect of the electric energy applied was negligible (73.8±1.9 and 75.8±2.2 g/100 g PI for 50 and 100 kJ/kg, respectively) (Figure 1). Notwithstanding, the PI yield was significantly higher ($p<0.05$) for control samples (53.8±2.0%) than for PEF treated ones (31.4±1.8% and 15.1±2.0% for 50 and 100 kJ/kg, respectively). Using a solubilization pH of 7.5 without pretreatment, Feliu-Alsina [3] found a lower protein content (58.3 g/kg) but a higher PI yield (67 %). Regarding PI technological properties (Figure 1), it was observed that WHC of PI from control samples was lower (2.5±0.1 g water retained/100 g PI) than for PEF ones (2.9±0.1 g water retained/100 g PI for 50 and 100 kJ/kg, respectively). The same trend was found for the OHC, which was higher (3.3±0.3 g oil retained/100 g PI) in PEF pretreated samples when the energy applied was 100 kJ/kg. High values of these parameters are valued to enhance the features of further meat-hybrid products where proteins extracted will be included. Solubilization time and temperature did not affect significantly ($p>0.05$) protein content, protein extraction yield, WHC or OHC.

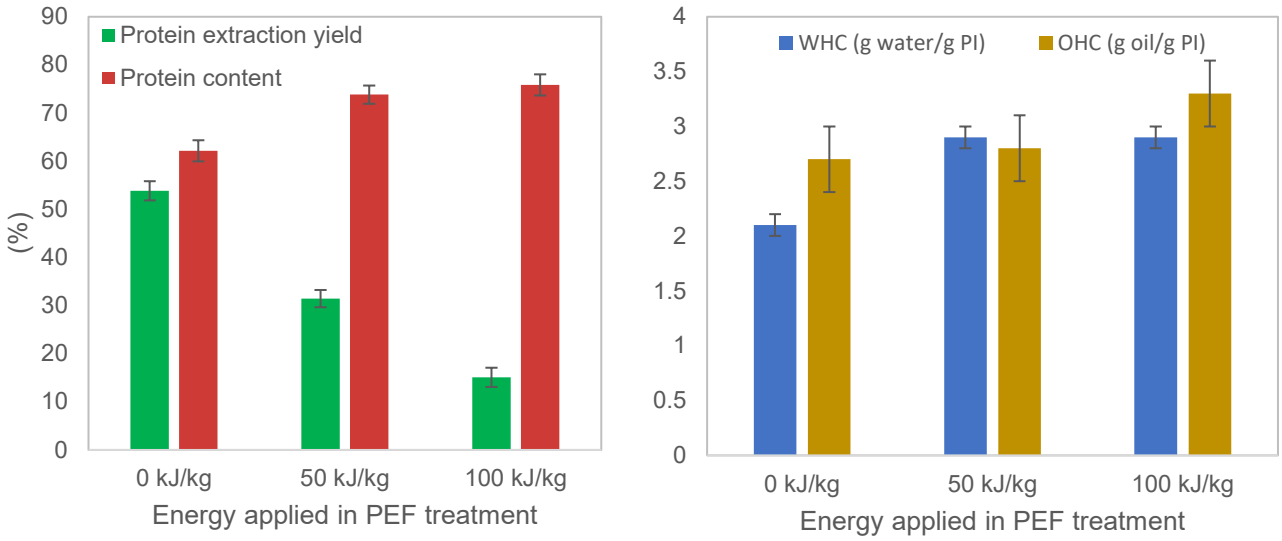


Figure 1 – Protein extraction yield, protein content, and techno-functional properties (WHC and OHC) of proteins extracted from pork liver following a standard pH-shift extraction and PEF pre-extraction (control-0, 50 and 100 kJ/kg).

## IV. CONCLUSION

PEF pretreatment during protein extraction improved the protein content of the protein isolate; nevertheless, reduced the protein extraction yield. Furthermore, WHC and OHC were enhanced in the protein isolate obtained with PEF pretreatment. Future studies should elucidate the mechanisms linked to the PEF application on the pork liver which are responsible of the differences observed in the protein isolates analyzed in the present work.

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