EFFECTS OF ELECTROLYZED WATER IN THE SHELF LIFE OF *OCTOPUS VULGARIS* PRESERVED UNDER MODIFIED ATMOSPHERE PACKAGING

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INTRODUCTION

➢ **EOW** has been regarded as a new sanitizer in recent years. Straightforwardly produced with salt and water, several advantages have been identified over other traditional disinfecting agents: higher effectiveness, easy operation, relatively inexpensive, and environmentally friendly [1]. EOW has been tested in food processing plants, meat, poultry and fresh-cut produce [2]. However, studies about its effectiveness as pre-treatment in fish products disinfection are scarce.

➢ *Octopus vulgaris* **shelf life** can be increased when stored under **MAP** [3]. Nonetheless, the appreciation and extend of consumption of octopus in Spain justify any additional improvement in quality and safety to increase its possibilities of commercialization.

➢ The **aim** of this work was to study the effects of the application of EOW technology on the shelf life of *Octopus vulgaris*, both in air and packed under MAP.

MATERIAL AND METHODS

Sample preparation: Fresh octopus (Vigo Bay) were purchased in a local market, headless and cutted by hand in two halves. These samples were divided in two batches, treated and untreated with EOW. Samples were finally packed in presence or absence of modified atmosphere (83% CO_2, 5.7% O_2, 11.3% N_2) and stored at 3±1ºC. ***EOW treatment***: EOW was produced by using an EO water generator Envirolyte® (EL-400) and further sprayed on the octopus.

Analysis: Psychrotrophic bacterial counts (NA,17ºC,72h) and mesophilic bacteria (PCA+1% NaCl, 31ºC, 48h) were carried out according with the standard methods in microbiology. Total volatile basic nitrogen (TVB-N) was determined according to Lücke and Geidel (1935) and Antonacopoulos (1960). Sensory analysis of tentacles was assessed by four trained panelist on the basis of QIM [4]. Trihalomethanes (THM) were determined by gas chromatography.

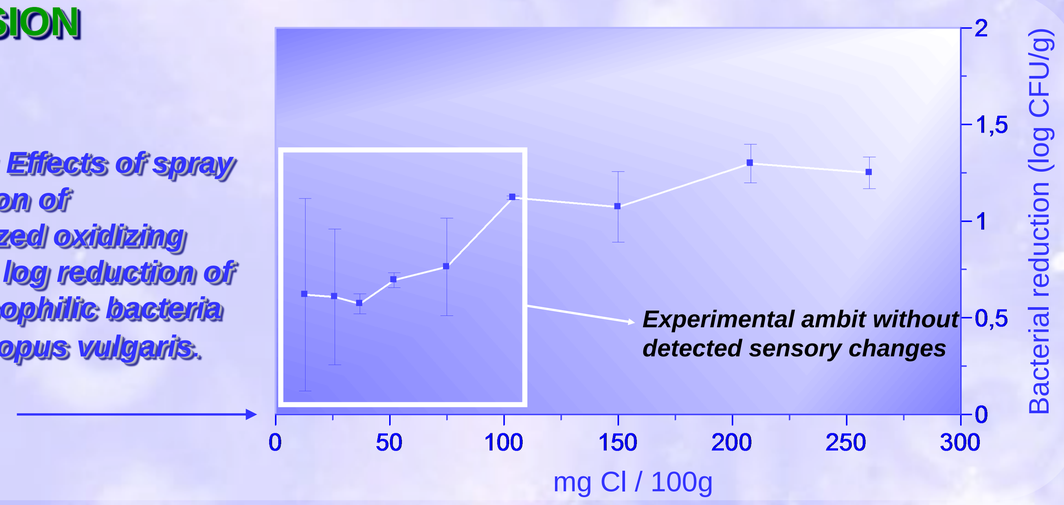
RESULTS AND DISCUSSION

Determination of the maximum dose of EOW applicable (MDA)

MDA was defined as the dose that maximizes bacterial reduction and assure sensory quality. MDA of EOW when applied in octopus could be established in 100 mg of active chlorine (AC) per 100 g, at which 1.2 log reduction in skin microbiota was reached (Figure 1). Application of higher doses gave rise to discoloration of tentacles. THM concentration was less than 1% of the legal limit (100 ppb) when concentrations slightly high MAD (180 mg AC/100g) were applicated.

Octopus (left) and spraying-system (right) used in the application of electrolyzed water (EOW)

Figure 1: Effects of spray application of electrolyzed oxidizing water on log reduction of skin mesophilic bacteria from Octopus vulgaris.



Effects of EOW decontamination on shelf life of *Octopus vulgaris*

A decreasing tendency (non significant) of total microbiota (in muscle and skin) and nitrogen compounds production associated with seafood spoilage was observed during time of storage after the application of 81 mgCl/100 g EOW in muscle of octopus and subsequently packed in air or in MAP. However, only the sum of EOW and MAP effects render significant differences in microbiological and chemical analysis respecting to the untreated samples (Figures 2, 3). By the contrary, sensorial analysis (Figure 4) does reflect significant differences between EOW-treated and no treated octopus, both in air and MAP, mainly giving rise to unpleasant off-odours. In fact, whereas unwashed samples were already rejected at 4th day of storage, EOW-treated octopus was considered unfit by the panel after 6 days of storage. MAP samples (both treated and no-treated) were acceptable even after 6 days of storage, but significantly higher level of freshness was observed in the EOW pretreated octopus. One hypothesis to explain the lack of significant differences between the analyzed quality variables after the application of EOW is that the unspecific effect of chloride (reacting with different biological molecules present in the system) can not be easily described by the traditional quality control analysis chosen in this work.

Figure 2: Changes in the total viable count (TVC) of muscle and skin of octopus during storage at 3ºC.

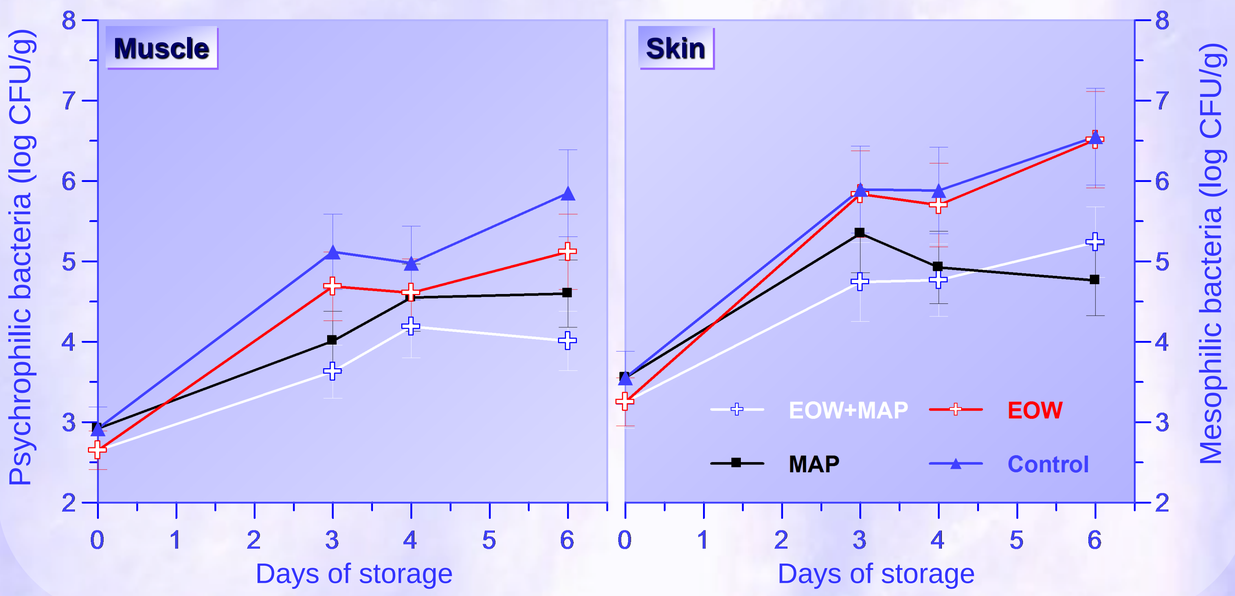
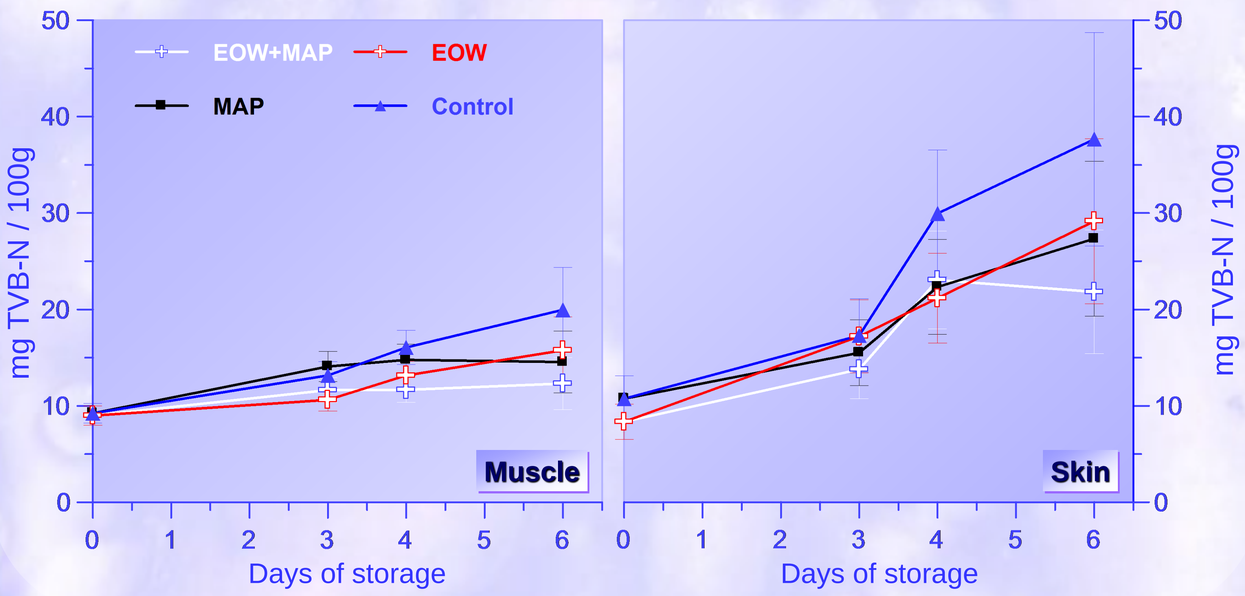


Figure 3: Changes in the TVB-N content in muscle and skin of octopus during refrigerated storage at 3ºC.



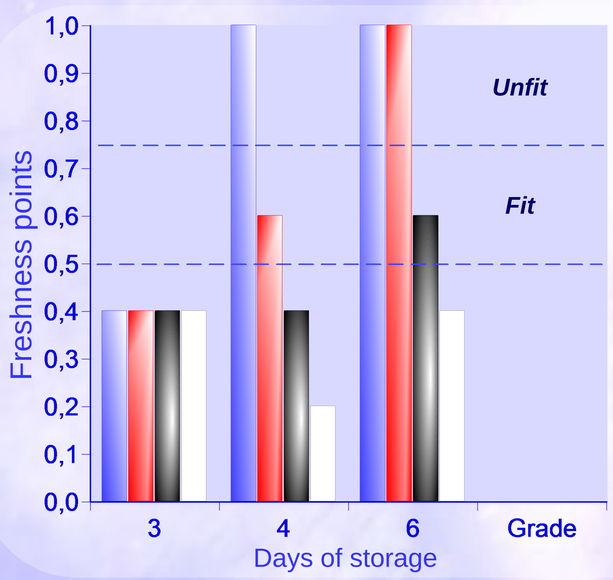


Figure 4: Changes in sensory scores of octopus tentacles.

Control
EOW
MAP
EOW+MAP

Table 1. Scale employed for evaluating the sensorial changes in skin of octopus.

Quality parameters	Demerit points (DP)
Appearance and colour	0-2
Odour	0-2
Mucus	0-1
Freshness points	*DP/5*

In this context, observed results highlights the importance of sensory analysis in food quality control as a global variable that could show important effects not reflected in individual quality variables. Although the effectiveness of applying EOW as pre-treatment of fish or seafood has been demonstrated previously ([5], [6]), studies about the repercussion of the initial disinfection in the further shelf life under storage are scarce.

Overall in this study, microbial and chemical results of EOW batch (with or without MAP) were lower than unwashed octopus, and this was reflected in a shelf life prolongation. Although no synergic effect between MAP and EOW could be demonstrated, additive effects led to samples with both treatments (EOW+MAP) reached the best results.

CONCLUSION

These results demonstrate that the application of EOW can be a good option to improve the quality and shelf life of *Octopus vulgaris* commercialized in air and packed under modified atmosphere.

References: [1] Huang YR, Hung YC, Hsu SY, Huang YW & Hwang DF. Food Control, 2008, 19, 329-45. [2] Hricova D, Stephan R & Zweifel C. J Food Protect, 2008, 71, 1934-47. [3] Ramilo G, Pastoriza L, Bernárdez M, Blanco T, Gallego A & Carrera AB. XVII Congreso SEM, Spain, 2010. [4] Barbosa A & Vaz-Pires P. Food Control, 2004, 15, 161-8. [5] Phuvasate S & Su Y. Food Control, 2010, 21, 286-91. [6] Huang YR, Hsieh HS, Lin SY, Lin SJ, Hung YC & Hwang DF. Food Control, 2006, 17, 987-93.

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