NANOENCAPSULATED CLOVE ESSENTIAL OIL USED IN STUNNING DURING SLAUGHTERING OPERATION IMPROVES THE QUALITY AND SHELF-LIFE OF FARmed GiltHeaD seABReAM (sparus aurata l.), AND DECREASES FISH WASTES IN THE URBAN CONSUMPTION CHAIN


1Department of Cell Biology and Histology, Faculty of Biology, Universidad de Murcia, Campus de Espinardo, 30100 Murcia, Spain. 2Food Engineering and Agricultural Equipment Department, Universidad Politécnica de Cartagena, Paseo Alfonso XIII, 48, 30203 Cartagena, Spain. *Email: amandaesperanza.lopez@um.es

IntroducTion

Waste in the food supply chain is characterized by a high ratio of product specific waste. Therefore, the generation of this waste could be avoidable if the quality of the finished product is enhanced and its shelf life increased (laythiikan et al., 2012). Pre-slaughter procedures should be carried out without causing avoidable excitement, pain, fear or stress conditions, so to assure not only acceptable standards of fish welfare, but also high quality fish. In aquaculture, sedative and anesthetic agents are very useful for reducing the stress caused by handling, sorting, transportation or artificial reproduction. Clove essential oil (CEO) is an effective, local and natural anesthetic. Many hatcheries and research studies use CEO to immobilize fish for handling, sorting, tagging and to suppress sensory systems during invasive procedures (javerhey et al., 2012). In this study we evaluate the use of crushed ice and liquid ice including clove essential oil (CEO) encapsulated in β-Cyclodextrins (β-CDs) embedded in the ice crystals, during stunning at the slaughtering operation, to improve the quality and shelf life of gilthead seabream by reducing stress, in preference (terrestrial tanks) and in farm/open sea conditions, analyzing its effect on fish stress (characterized by glucose, lactate, and cortisol levels in plasma), and shelf-life (characterized by sensory and microbial quality of the fish) in ice (including other antimicrobial essential oils in the ice crystals).

Results and Discussion

When fish are subjected to hypoxia and hyperthermia during pre-slaughter and slaughter increase in stress level occurs resulting in increased muscle activity through vigorous movements, causing an increase in the anaerobic energy metabolism based on fermentation of glycogen or glucose (De Castro et al., 2017). This is the reason why glucose and lactate levels showed significant differences between the treatments studied in this work. Glucose levels decreased when CEO-β-CDs (35, 60 and 60 mg/kg) was added to CI and to UI, respectively, and to treatments control (using stunning with CI), seawater at 1:1 ratio or UI at the same ratio, and without addition of CEO-β-CDs. Blood lactate has the same behaviour. According to other works, blood glucose and lactate levels appear to be sensitive and reliable indicator of stress in fish (Elkonged, 1974; Well and Parkhurst, 1986). CEO-β-CDs improve the stress conditions of gilthead seabream at slaughtering time by considering the decrease in the glucose levels in comparison to those levels of fish slaughtered without stunning with CEO-β-CDs (Figure 1). This decrease is higher when the concentration of the CEO used is low (10 to 15 mg/kg).

Conclusion

- All the stress-related parameters analyzed indicated that CEO-β-CDs incorporated into the ice crystals of CI mixed with seawater can be considered as a useful anesthetic at farm gilthead seabream for stunning at slaughtering operation. 
- Pseudomonas counts were reduced by more than 0.5 Log CFU/g after 19 storage days. 
- Mesophilic aerobic bacteria counts reached 6.52 log CFU/g for control package icing and 5.8 log CFU/g for package icing including EOs-β-CD after 19 days of storage. 
- Psychrotrophic counts of samples packaged in ice with EOs-β-CD were reduced by 1 Log CFU/g after 19 days of storage. 

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