

Effect of Adjustable Parallel High Voltage Electrostatic Field on Freshness and Ca²⁺-ATPase Activity of Tilapia during

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ABSTRACT

Live tilapia (*Oreochromis niloticus*) immediately sacrificed by hitting were prepared as roundfish, three pieces fillet, and actomyosin extracted from ordinary muscle. The three types fish were stored in a refrigerator (4 °C) installed with adjustable parallel high-voltage electrostatic field (HVEF) and controlled at the intensity of 0, 300, 600 and 900 kV/m. The changes in appearance, freshness, color, quality, and muscle properties were investigated. The results obtained were as follows: 1.Round tilapia gradually faded from grey-black to brown, developed ammonia odor, and the eyes became turbid during common refrigeration. All the extrinsic deterioration could be decreased by HVEF above 600 kV/m. 2.pH of tilapia meat decreased at earlier stage due to glycolysis and subsequently increased at later period by growth of microorganisms. This tendency was retarded when the meat was stored in HVEF intensity above 600 kV/m. 3.No obvious changes in “ Hunter L ”, but slightly decreased in “ Hunter a ” and obviously increased in “ Hunter b ” for the meat stored in HVEF were observed. The variations of whiteness and chroma were similar to the tendency of “ Hunter a ” and “ Hunter b ”, respectively. HVEF refrigeration retarded the change of color difference (ΔE value). 4.Both K values and VBN of tilapia meat increased with increasing storage period. They exceeded spoilage standard 60% for K value at 6th day and 25 mg/100 g for VBN at 5th day, respectively. But for the HVEF treatment by 900 kV/m, K value approached 60% at the 8th day, while VBN only was only 24.21 mg/100 g by 600 kV/m at the 7th. day. HVEF obviously retarded the deterioration of biochemical quality. 5.Total plate counts (TPC) reached 3.51×10^6 CFU/g meat at the 8th day, while 4.02×10^5 CFU/g meat was observed for that of stored in HVEF at 900 kV/m Slight inhibition effect on microorganisms was confirmed. 6.As an indicator of lipid oxidation, TBA value reached 0.124 ppm during refrigeration at 4 °C at 8th day. As long as HVEF treatment, rancidity inhibition effect (84% in TBA to contrast for 300 kV/m, 73% for above 600 kV/m) was shown. 7.Actomyosin Ca-ATPase activity gradually decreased during storage. Approximately similar activities ($0.4 \mu\text{mol Pi/min} \times \text{mg protein}$) were observed for refrigeration (4 °C) at the 5th day and combined with HVEF (600-900 kV/m) at the 8th days. This indicates that HVEF intensity was related to the keeping of Ca-ATPase activity and the effective intensity was speculated at about 500 to 600 kV/m. 8.Solubility of both water-soluble and salt-soluble proteins decreased to the minimum values for tilapia meat at the 8th day. No matter HVEF treatment or not, no significant difference was found. 9.In summary, HVEF was a practicable device for tilapia preservation based on evaluation of biochemical indices, microorganism inhibition and appearance. The HVEF can be expected as a potent physical technology replacing chemical preservatives and widely applied to freshness keeping of food in the future.

Keywords : high-voltage electrostatic field、tilapia、freshness and quality

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