QUALITY OF CATFISH FILLETS DURING STORAGE

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The aim of the presented work was to evaluate the effects of lactic acid or lysozyme combined with chlorine treatment on quality of catfish fillets. Skinless catfish fillets were washed in 100 ppm chlorine solution and then treated with 2.5% lactic acid or 0.5% lysozyme, whereas control samples were washed only with tap water. After treatment, catfish fillets were vacuum packed and stored at 2°C for 10 days. The effectiveness of treatment on surface color, pH, firmness and total viable cell counts were determined. Considering food safety, microbiological results were primarily evaluated. Treated catfish fillets had declining microbial counts in comparison with control. Treatment with chlorine followed by lysozyme or lactic acid reduced contamination by 1.8 and 2.4 log CFU/cm^2, respectively, compared to control samples. Number of microbes on catfish fillets treated with lysozyme or lactic acid after 10 days were still less than that of control, 1.6 and 2.5 log CFU/cm^2, respectively. The results indicated that the combination of chlorine and lysozyme or lactic acid was beneficial in controlling the growth of microorganisms on catfish fillets during storage.

Keywords: catfish, chlorine, lactic acid, lysozyme, microorganism

Introduction

Catfish, is a popular fresh water fish providing key animal proteins for humans (Orban et al., 2008). In addition, catfish is also a vital source of minerals, vitamins, fatty acids and essential supplement for child growth and adult health (Ahmed et al., 2015). Besides the health benefits, fish has been involved in foodborne diseases (Kim and Marshall, 2001). It is well known that fishes are continuously exposed in nature to a wide range of microorganisms particularly in water and their feed (Ringø&Gatesoupe, 1998).

Moreover, handling also served as contaminating source of minimally processed food (Kim and Marshall, 2001). The interesting topic nowadays is food quality comprising a set of standards about nutrition and safety of product (Park et al., 2017). Therefore, the aim of this study was to investigate the effect of the combination of chlorine and lysozyme or lactic acid in decreasing microorganisms on catfish fillets during storage.

Materials and methods

Materials

Catfish (*Ictalurus punctatus*) were bought from a local catfish plant. On the same day, catfish were deboned and skinned. Fillets of catfish cut into 700-800 g pieces were washed with 100 ppm chlorine solution, then treated with 2.5% lactic acid or 0.5% lysozyme, whereas control samples were washed only with tap water. After treatment, fish fillets were packed in vacuum bags and stored at 2°C for 10 days.

Measurements

Measurements were carried out on the 1^{st}, 4^{th}, 7^{th} and 10^{th} days. Three packages of each group were removed from the fridge to analyze the quality indices of catfish fillets for each storage interval.

Surface color. Surface color of catfish was measured with a portable Minolta Chroma Meter CR-400 (Minolta Corporation, Osaka, Japan). CIE L*, a* and b* color characteristics were determined at three equidistant points on each fillet.

Drip loss. The drip loss from fillets was determined by the amount of liquid accumulated in the packages at each storage interval and calculated as the weight of liquid in the packages divided by initial weight of catfish fillets multiplied by 100.

Firmness. Firmness of fillet was determined by the force required to penetrate each slice, using Stable Micro System TA-XT Plus, UK. Six spots located on each fillet slices were punctured to a depth of 15 mm using a 2 mm round-surfaced cylindrical probe with 2mm/speed. The average of those six measurements was considered as one replicate. Results were expressed as N.

pH. pH of samples was measured at 3 points on each pieces with a hand-held pH meter (Testo 206-pH1) by placing the electrode directly onto the catfish fillet surface. Mean pH values were reported as the average of three measurements of each piece.

Microbiological analysis. Microbiological tests were carried out on day 0 (after treatment), and on the 1st, 4th, 7th, 9th and 10th days. Samples were homogenized and diluted. Total viable counts (TVC) were determined after 48 h incubation on Plate Count Agar at 37 °C.

Statistical analysis

All data were processed by SPSS (SPSS Inc, USA) using analysis of variance (ANOVA) followed by Tukey's method with a significance level of $P<0.05$. The results were reported as a mean with standard deviations.

Results

The surface pH of catfish fillets increased during the storage period. The pH value of fish treated with chlorine-lactic acid was lower than that of others due to the effect of lactic acid (Fig. 1).

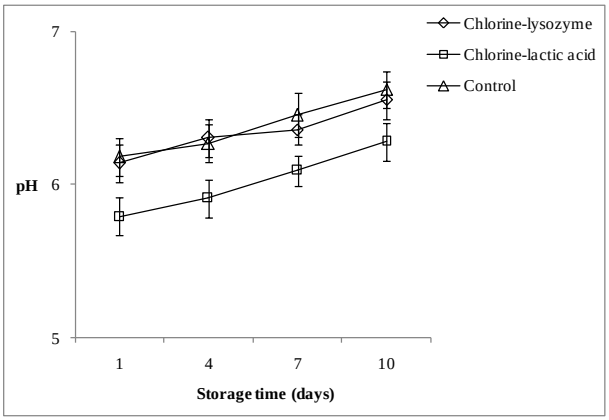

Fig. 1. pH of catfish fillet during storage

The firmness of catfish fillets declined during 10 days of storage (Fig. 2). The control had the lowest value in firmness compared to other treatments. However, there was no significant difference between treatments.

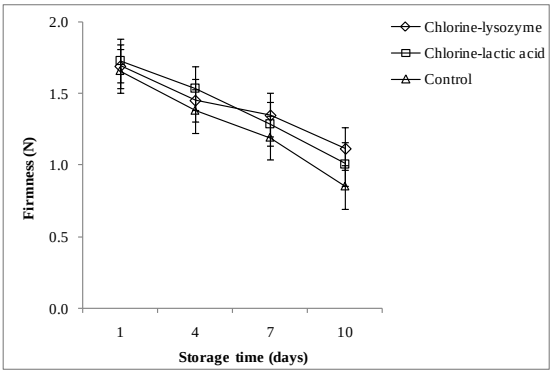

Fig. 2. Firmness of catfish fillet during storage

The drip loss of fish fillets increased throughout storage. No significant difference was observed between treatments. Drip loss was around 2.7% at the end of the experiment (Fig 3).

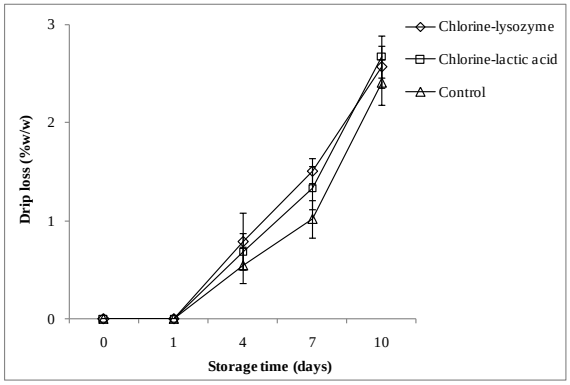

Fig. 3. Drip loss of catfish fillet during storage

The surface color of catfish fillets changed during storage (data not shown). Samples treated with lactic acid were lighter than the other samples (Fig. 4).

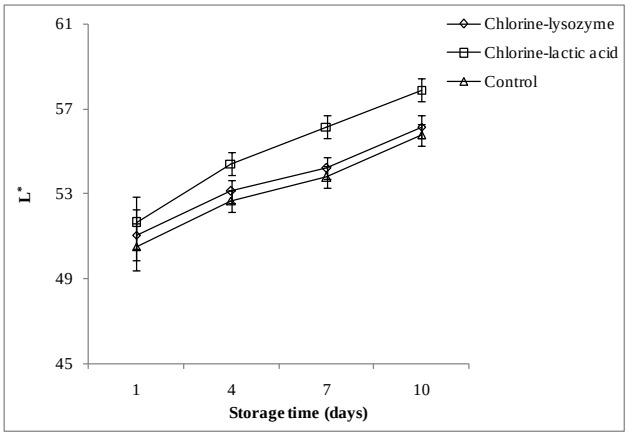

Fig. 4. L^* value of catfish fillet during storage

Treatment with lactic acid had negative effect on sensory attributes, lactic acid caused flesh discoloration. This was coincident with a previous report (Marshall and Kim, 1996). Fig.5 showed that chlorine-lysozyme and chlorine-lactic acid had benefit in controlling the level of microorganisms on fish fillets during storage. Treatment with chlorine-lysozyme and chlorine-lactic acid reduced the contamination by 1.8 log cfu/g and 2.4 log cfu/g, respectively, compared to control.

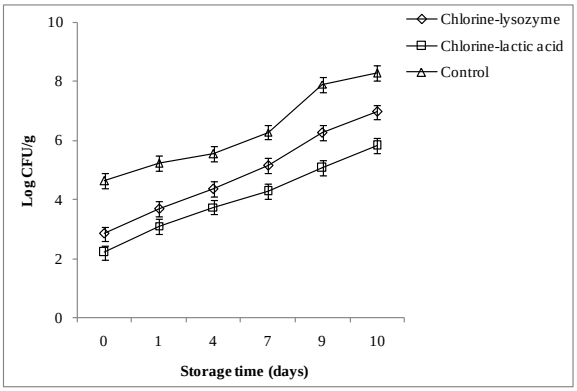

Fig. 5. Total viable counts of catfish fillet during storage

At the end of the experiment, the differences between treatments were still significant. Fish treated with chlorine-lactic acid had the lowest number of microorganisms, compared to those of other treatments. Lactic acid was effective in reducing the initial counts and growth of microorganisms during storage. This was in agreement with earlier reports (Kim et al., 1995; Kim and Marshall, 2001; Verhaegh et al., 1996). Moreover, sensory evaluation of cooked fish fillets at the end of storage showed that treated fish was still acceptable (data not presented).

Conclusion

The results of this study indicated that chlorine-lactic acid or chlorine-lysozyme treatment could maintain the quality of catfish fillets during cold storage. Treatment with chlorine-lactic acid or chlorine-lysozyme benefited decontamination of catfish fillets.

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