

HISTOLOGICAL CHANGES ON MILKFISH SKIN (*Chanos chanos*) DURING POSTMORTEM**Medal Lintas Percka¹⁾, Tati Nurhayati^{1)*}, Sri Nuryati²⁾**¹⁾ Departement of Aquatic Product Technology, ²⁾ Departement of Aquaculture,

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*)e-mail: nurhayati7870@yahoo.com**ABSTRACT**

Aquatic products are easily perishable commodity, one of them are fish skin. Information about the declining quality of milkfish skin has not been revealed yet. Milkfish skins were analysed to determine the chemical composition, postmortem storage on chilling temperatures, and compared the microstructure changes during postmortem. Measured parameters in this study were proximate, organoleptic score, and histological examination to observe the tissue damage that occurred in post mortem storage. Milkfish skin contained moisture, ash, lipid, protein, and carbohydrate were 64.74%; 2.43%; 4.76%; 23.74%; 4.34%, respectively. Milkfish skin entered prerigor at 0 days, rigor mortis at 8 days, postrigor at 14 days, and the decomposed phase at 23 days of chilled storage. Milkfish skin began experiencing damage in rigor mortis by the occurrence of degeneration. In postrigor and decomposed phase occurred cariolytic. In addition, in the decomposed phase there were empty spaces marked by the loss of the milkfish skin tissue due to cell death.

Keyword: chilling, histology, milkfish skin, postmortem.

INTRODUCTION

Milkfish is one of the abundant fish species and potent commodities in Indonesia. Milkfish production highly increased 47,19% in 2010 (Kelompok Kerja Data Statistik Kelautan dan Perikanan 2010). Fish skin is part of fish body that can be used as a raw material for manufacturing process such as fish crackers, gelatin, gelatin hydrolysate, edible/biodegradable film and collagen. Fish skin is rapidly degraded during postmortem storage as well as whole fish.

Microbial and chemical methods as well as sensory changes have been analysed to evaluated fish freshness (Olafsdottir *et al.* 1997; Nurjanah *et al.* 2004; Roth *et al.* 2006; Nurilmala *et al.* 2009; Ocano-Higuera *et al.* 2009; Ocano-Higuera *et al.* 2011, Li *et al.* 2011). Information about the declining quality of milkfish skin has not been revealed yet, especially on histological changes during postmortem. Histological examinations are needed to uncover hidden quality of raw material.

The objectives of this study were to determine chemical composition of milkfish skin, postmortem storage on chilling temperature and to demonstrate microstructure of milkfish skin during postmortem.

MATERIAL AND METHOD

Milkfish with size 200-250 gram/body were purchased from the farmer's pond in Kampung Melayu, Teluk Naga, Tanjung Pasir, Tangerang-Banten regency, Indonesia. Milkfish

were freshly caught and completely free of additives. All fish were killed immediately and stored at chilling temperature.

H_2SO_4 , kjeltab selenium, $NaOH$, H_3BO_3 , n-hexana, HCl , 10% neutral buffered formaline, 50-100% alcohol, xylol, hematoxylin, eosin, and mounting agent were purchased from MERCK (Darmstadt, Germany), parafin was purchased from Thermo Scientific (Cheshire, UK).

Moisture, ash, lipid and protein content of milk fish skin were determined by AOAC (1995), and carbohydrate was counted by difference method. Whole milkfish were observed by organoleptic tests to determined every phase on postmortem changes.

Histological preparation

Milkfish skin were observed by organoleptic test. It took from every phase on postmortem changes. The skin was cut from dorsal portion and prepared for histological examination. These samples were immersed in fixative solution, alcohol, xylol, embedded in parafin, blocking, staining with hematoxylin eosin, and cell adhesion using mounting agent (Angka et al. 1990).

RESULT AND DISCUSSION

1. Proximate composition

Proximate composition of the milkfish skin was determined (Fig. 1). Its moisture content was 64,74%. Moisture content represent freshness and shelf life on foodstuff.

Ash content on fish skin probably derived from dermis layer. Angka et al. (1984) noted that teleostei fish scales is a dermis bone consisting of a mineral matrix of collagen fibers wrap thick. Ash content on milkfish skin was 2,43%. Jamilah et al. (2011) showed that ash content on Red Tilapia (*Oreochromis nilotica*) skin was 0,51%. The difference of ash content on fish skin is caused by habitat, enviromental, species of fish, sizes, ages etc. Muyonga et al. (2004) showed that different ages of *Lates niloticus* affecting ash content on its skin. Skin from adult fish contain more ash than young one, probably because of increasing calcification of scales with age.

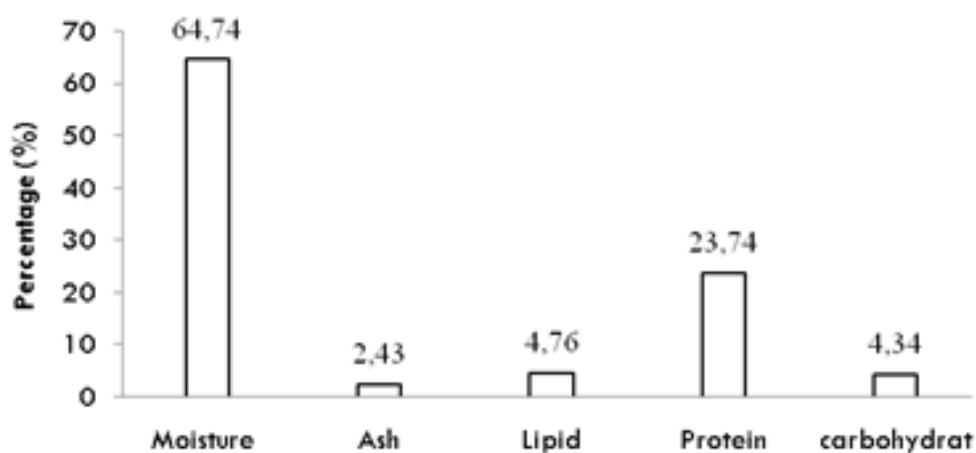


Figure. 1. Proximate composition of the fresh milkfish skin

Lipid content on milkfish skin was 4,76%. It contained high enough lipid. Lipid content on fish skin probably derived from hypodermis or subcutaneous layer. Chinabut *et al.* (1991) noted that hypodermis or subcutaneous is the deepest layer on fish skin. The most striking characteristic of this layer is the presence of adipose cell. Different age of *Lates niloticus* show different lipid content on its skin (Muyonga *et al.* 2004). Skin from adult fish contain more lipid than young one, probably because the fish accumulate subcutaneous fat as their growth.

Protein content on milkfish skin was 23,74%. The high protein content on fish skin may derived from dermis layer. Chinabut *et al.* (1991) noted that dermis layer on fish skin consisted of stratum spongiosum and stratum compactum, whereas both of these layer contained collagen. The main source of collagen on fish is in the skin and scales.

Carbohydrate content on fish skin has been counted by difference method. Carbohydrate content on fish skin was 4,34%. This carbohydrate included polysaccharide calling glikogen. Hadim *et al.* (2002) noted that glikogen is a kind of carbohydrate which is abundant in fish. Angka *et al.* (1984) stated that glikogen is derived from excess glucose supply in blood. Stratum spongiosum on dermal layer consists of blood vessel distributing nutrients for skin.

2. Organoleptic score

Organoleptic score of milkfish skin (*Chanos chanos*) has been decreased during postmortem of chilled storage. Milkfish skin entered prerigor, rigormortis, postrigor and decomposed phase up to day 0, 8, 14, 23 of storage, respectively (Fig. 2).

Milkfish skin maintained high and good quality during the first 8 days and fair quality 9-13 days of chilled storage. Ozugul *et al.* (2006) showed that wild turbot skin (*Scophthalmus maximus*) aspect and consistency still be acceptable up to day 19 of chilled storage. Aubourg *et al.* (2005) and Rodriguez *et al.* (2006) studied farmed turbot and found high and good quality during the first 14 days of chilled storage and up to day 22 for turbot storage in slurry ice or up to day 14 for turbot in flake ice, respectively.

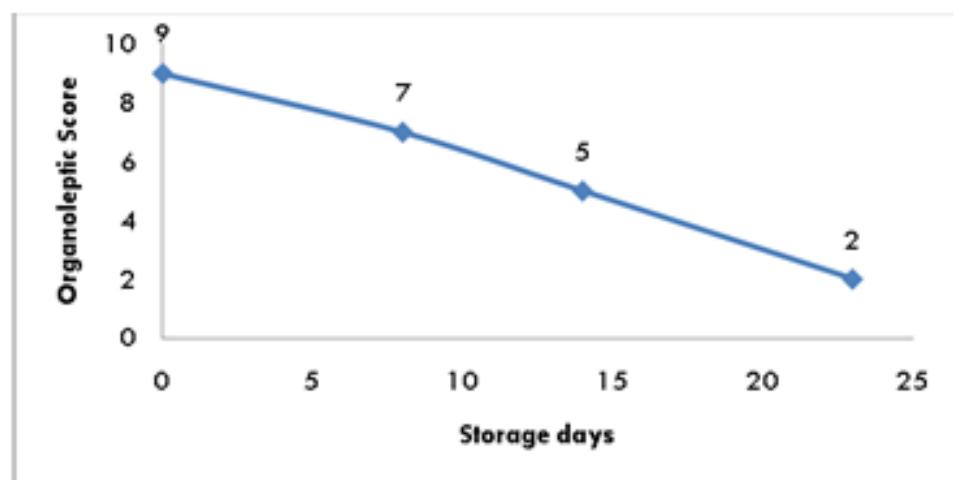


Figure. 2 Organoleptic score of the milk fish skin during postmortem of chilled storage.

3. Histological changes during postmortem

Fish skin is highly composite structure that consist of squamous epidermis, the underlying dermis and the last hypodermis or subcutaneous layer. Dermis layer can be differentiated in a stratum spongiosum and stratum compactum. Both strata characterized by their connective tissue, collagen bundles. Hypodermis or subcutaneous layer of fish skin characterized by their adipose cells and melanin (Chinabut et al. 1991).

Epidermis, dermis and hypodermis or subcutaneous layer on prerigor phase clearly appeared. The outer epidermis is dominated by mucocytes and melanin pigment. The dermis of *Chanos chanos* skin is differentiated into stratum spongiosum and stratum compactum. Both strata are characterized by their collagen bundles. The dermis of *Chanos chanos* is provided with a collagenous stratum compactum of considerable thickness, a stratum spongiosum with loosely arranged fibers. Collagen bundleless in stratum spongiosum arranged in sponge patterns. As shown by histological methods, hypodermis or subcutaneous layer it was look like empty spaces. Cormack et al. (1994) stated that lipid in subcutaneous layer are lost when histological processing.

Fish skin is rapidly degraded during postmortem storage. Microstructure of fish skin has been changed during postmortem storage (Figure. 3).

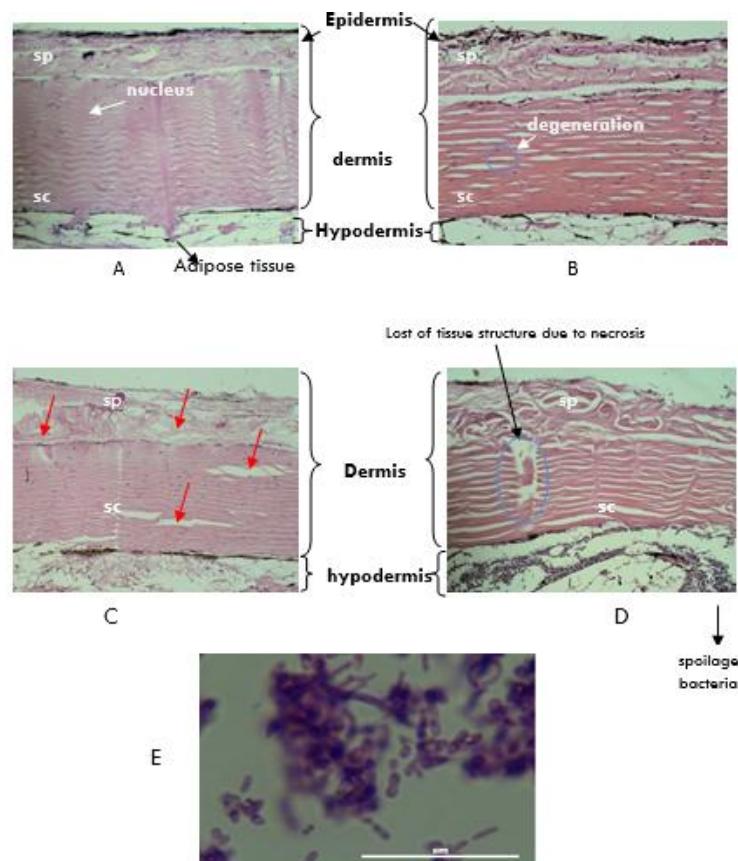


Figure. 3 Cross section milkfish of the dorsal skin stained with hematoxylin eosin; A prerigor phase, B rigor mortis phase, C postrigor phase, D decomposed phase, E spoilage bacteria (sp: stratum spongiosum; sc: stratum compactum; → breakdown of collagen fibers)

Milkfish skin began experiencing damage in rigor mortis by the occurrence of degeneration. Degeneration is biochemical or structural changes or combination of them. Degeneration is an early step of necrosis (cell death). It was an irreversible and caused by lack of oxygen supply. It is disturbed cell metabolism. Degeneration of milkfish skin are characterized by swelling and thickening of collagen tissue.

In postrigor and decomposed phase are occurred cariolytic and breakdown of collagen fibers on dermal layer. Breakdown of collagen fibers may be caused by metalocollagenase enzyme. Cariolytic is the disintegration of a cell nucleus, which occurs on death cell. Cariolytic was characterized by loss of the cell nuclei in the tissue. In addition, the decomposed phases were empty spaces marked by the loss of the milkfish skin tissue due to cell death (necrosis). Spoilage bacteria was detected on decomposed phase.

CONCLUSION

Protein content on milkfish skin highly enough. Lipid and ash content on it was lower than protein. The organoleptic score of milkfish skin has been decreased during storage. Milkfish skin maintained high and good quality during the first 8 days of chilled storage. Microstructure of fish skin began damage in rigor mortis phase.

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