

Changes in sarcoplasmic proteins of cultured yellowtail

Seriola quinqueradiata burnt meat

(Received November 2, 2011)

(Accepted January 20, 2012)

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Abstract

Changes in sarcoplasmic proteins during the burnt meat occurrence of cultured yellowtail were investigated using SDS-polyacrylamide gel electrophoresis (SDS-PAGE) and 2D-gel electrophoresis. The decreased proteins during burnt meat occurrence were identified as muscle glycogen phosphorylase (PYGM), phosphoglycerate kinase (PGK), creatine kinase (CK), glyceraldehydes-3-phosphate dehydrogenase (GAPDH), L-lactate dehydrogenase (LDH) and adenylate kinase, respectively, by MALDI-QIT-TOF mass spectrometry (MALDI-QIT-TOFMS). The decreases of sarcoplasmic proteins were little suppressed by the protease inhibitors *in vitro*. In contrast, some sarcoplasmic proteins such as PYGM, GAPDH and aldolase were appeared in myofibril fraction of burnt meat. These results suggested that the sarcoplasmic proteins are insolubilized and shifted to myofibrillar fraction, when the burnt meat occurs in cultured yellowtail.

Keywords : burnt meat, sarcoplasmic protein, myofibrillar protein, 2D-gel electrophoresis, MALDI-QIT-TOF mass spectrometry

I Introduction

“Burnt meat” is a term used by aquaculturists and commercial buyers to describe the white coloration of yellowtail or tuna muscle. It has a pale, grainy and exudative, and is considered unsuitable for consumption as raw meat. The quality of burnt meat may be caused by high temperature in the environmental, low ultimate muscle pH and slaughter methods¹⁻⁴). In *post-mortem*, pH decrease was found in burnt meat of yellowtail and it may be due to a rapid *post-mortem* glycolysis^{1, 5}). Recently, several researches have suggested that the denaturation of muscle proteins is a possible cause of the quality loss in the burnt meat^{1, 5-7}).

The muscle proteins are consisted of sarcoplasmic protein, myofibrillar protein and myostroma protein. Concerning myofibrillar protein, Konagaya and Konagaya⁸) reported that approximately 60-90% myofibrillar proteins were denatured in burnt red-meat fish. The degradation of myosin heavy chain (MHC) and α -actinin during appearance of burnt meat

of yellowtail were also reported^{5, 6}). In our previous studies on the degradation of myofibrillar proteins of burnt meat of cultured yellowtail, MHC was degraded and it may be caused by a myofibril-bound EDTA sensitive protease (MBESP)⁹). The similar phenomenon, pale, soft and exudative (PSE) meat was also reported in pork¹⁰⁻¹²). The PSE meat has high drip, a very pale color and exhibits denatured myofibrillar proteins¹³).

Concerning sarcoplasmic protein, McLoughlin and Goldspink reported that the solubility of sarcoplasmic proteins decreases and it may cause the change of color in pig muscle¹⁴). Monin and Laborde¹⁵) suggested that the sarcoplasmic proteins play an important role in determining pork WHC (water-holding capacity), and the precipitation of it may cause the increased drip loss in PSE meat. In addition, Ochiai⁷) reported that some sarcoplasmic proteins, such as creatine kinase (40 kDa) in the burnt meat of wild or cultured bluefin tuna disappeared and it may be hydrolysed by cathepsins B and L. However, there is no report about the changes in sarcoplasmic proteins of burnt meat of yellowtail.