

Effect of hardening process prior to harvest on taste of the Pacific oyster

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Abstract

Generally, in Hiroshima Prefecture, Japan, the cultivation of the Pacific oyster *Crassostrea gigas* involves a process called “hardening” in which the oysters are intermittently left under anaerobic conditions by hanging them on racks in the intertidal zone for several months before the primary suspension of the oysters from offshore rafts. We investigated the effects of intermittent anaerobic loading on oysters, mainly for taste, using triploid Pacific oysters in summer and normal diploid oysters in winter. High performance liquid chromatography (HPLC) was used to quantify free amino acids and ATP-related compounds, and spectroscopic analysis was used to measure the amount of glycogen, which is an energy source for oysters and indicates their nutritional condition. In addition, sensory evaluations were conducted by the panels. In the summer experiment, the levels of several free amino acids, mainly related to sweetness, and the umami taste in the sensory evaluation were significantly higher, whereas the amount of glycogen did not change in the hardened group compared to the control group. In contrast, in the winter experiment, the levels of many free amino acids decreased in the hardened group compared to those in the control group. At the same time, glycogen levels and soft tissue weight also decreased. These results showed that the rearing environments of the hardened and control groups may have differed significantly between summer and winter. However, this study suggests that providing the oysters with intermittent anaerobic conditions just before harvest in summer may improve the taste.

Keywords : Pacific oyster, anaerobic condition, taste components, free amino acids, hardening

I Introduction

During the cultivation of oysters, before their suspension from rafts offshore, they are hung on racks in tidal flats for several months to raise the survival rate afterwards. This rearing process in mudflats is called hardening, that is, “yokusei” in Japanese. The juvenile oysters attached to the hanging strands are ejected from the sea twice a day by the rising and falling tides and are exposed to intermittent anaerobic conditions for several months. Therefore, juvenile oysters have strong resistance to environmental changes¹⁾.

Bivalves have strong anaerobic tolerance; when the environment around the bivalve becomes anoxic, glycogen is decomposed and derivatized by anaerobic metabolism to alanine (Ala), succinic acid, and propionic acid produced as end

products²⁾. The anaerobic response has also been investigated in many other bivalves. It has been reported that the levels of free amino acids increase in the clam *Corbicula japonica* reared under anaerobic conditions after harvest in Lake Shinji in Shimane Prefecture³⁾. This may be because glycogenolysis occurs in the glycolytic system under anaerobic conditions, which supplies Ala and proline (Pro) that are related to sweet taste⁴⁾. In addition, we have observed that storing *Venerupis philippinarum* clams under anaerobic conditions for 24 h after harvest increases the free amino acids, giving an umami taste and preference in sensory evaluation (data not shown). It results in small but good-tasting oysters. Therefore, in this study, we investigated the effects of intermittent anaerobic rearing on the taste of oysters by returning oysters to hardening racks immediately before harvesting in summer and winter.

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