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Quality differences of whole ungutted sea bream (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*) while stored in ice

S. Cakli *, B. Kilinc, A. Cadun, T. Dincer, S. Tolasa

Ege University, Fisheries Faculty, Fish Processing Technology Department, 35100 Bornova-İzmir, Turkey

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Abstract

The aim of this study is to determine the quality changes in whole ungutted sea bass and sea bream while stored in ice. Changes in chemical quality were determined by using pH, total volatile basic nitrogen (TVB-N, mg N/100 g), trimethylamine (TMA-N, mg/100 g), thiobarbituric acid (TBA, mg malonaldehyde/kg), water activity (a_w), color measurement, and sensory analysis. Changes in microbiological quality were determined by using the analysis of total viable mesophilic and psychrophilic bacterial counts. Result of this study indicated that the shelf life of sea bass and sea bream stored in ice as determined by overall acceptability sensory scores and microbiological data was 15 days.

Keywords: Sea bream; Sea bass; Quality

1. Introduction

World catches of fish have increased in the 1970s and 1980s but seem to have stabilized since 1988 to just under 100 million tons. As the human population is ever increasing, it means that less fish will be available per caput every year. Nevertheless, a large part of this valuable commodity is wasted: it has been estimated by FAO that post-harvest losses (discards at sea and losses due to deterioration) remain at a staggering 25% of the total catch. Better utilization of the aquatic resources should therefore aim primarily at reducing these enormous losses by improving the quality and preservation of fish and fish products and by upgrading discarded low value fish to food products.

It is a common experience that the quality and storage life of many fish decrease if they have not been gutted. During feeding periods the fish contain many bacteria in the digestive system and strong digestive enzymes are produced. The latter will be able to cause a violent autolysis post mortem, which may give rise to strong off-flavour especially in the belly area, or even cause belly-burst. On the other hand, gutting means exposing the belly area and cut surfaces to the air thereby rendering them more susceptible to oxidation and discoloration. Thus, many factors such as the age of the fish, the species, amount of lipid, catching ground and method, etc., should be taken into consideration before deciding whether or not gutting is advantageous.

The extension of fish shelf life by chilling is essentially due to the reduction in the growth rate and metabolic activity of spoilage causing microorganisms. Sea bass is a high quality, delicate and expensive fish. Although there are many food preservative systems available today, there continues to be a need for new compositions in the area of fresh fish conservation.

The common gilthead sea bream (*Sparus aurata*) consists together with the sea bass (*Dicentrarchus labrax*), the two most important economically cultured fish species in the Mediterranean area (Smart, 2001). The common gilthead sea bream (*S. aurata*) consists together with the sea bass (*D. labrax*), the two most important economically cultured fish species in the Mediterranean area (Smart, 2001). Over the past decade demand both in Turkey and in

* Corresponding author. Tel.: +90 2323434000/1300; fax: +90 2323747450.
E-mail address: cakli@mail.ege.edu.tr (S. Cakli).

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Europe for fresh sea bream has increased significantly because of its taste, aroma and overall quality. To meet this increasing demand, aquaculture companies have expanded production. Total fishery production of Turkey is approximately 627 847 tons, of which aquaculture production is 61 165 tons and 11 681 tons of sea bass and sea bream (*S. aurata*), respectively.

Sea bass (*D. labrax*) has white flesh, mild taste and low fat content (Body, Green, & LePors, 1992). European sea bass (*D. labrax*) is one of the main aquaculture fish products in the European Union and concerns an annual production of around 51 000 tons (FEAP, 2002). The wide competition among producing countries in the Mediterranean area (Turkey, Greece, Italy, Spain) and the consequent lowering of marked prices are demanding the differentiation and characterization of sea bass quality that has also occurred for other local foods. 14 339 tons of sea bass (*D. labrax*) was produced in aquaculture in Turkey (Anonymous, 2002). The different rearing systems and feeding regimes used for sea bream and sea bass production may affect flesh quality, especially in terms of fat concentration and quality (Alasalvar et al., 2001; Ladrat, Bagnis, Noël, & Fleurence, 2004; Papadopoulos, Chouliara, Badeka, Savvaidis, & Kontominas, 2003; Parisi, Franci, & Poli, 2002; Poli et al., 2001; Simeonidou, Govaris, & Vareltzis, 1998; Xiccato, Trocino, Tulli, & Tibaldi, 2004).

Similar experiments with other cod-like species show a more differentiated picture. In the case of haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*), saithe (*Pollachius virens*) and blue whiting (*Micromesistius poutassou*), it is observed that ungutted fish stored at 0 °C suffer a quality loss compared with gutted fish. Some off-odours and off-flavours are detected, but ungutted haddock, whiting and saithe are still acceptable as raw material for frozen fillets after nearly one week on ice (Huss & Asenjo, 1976). Quite different results are obtained with South American hake (*Merluccius gayi*), where no difference is observed between gutted and ungutted fish (Huss & Asenjo, 1977).

The aim of this study was to determine the chemical, microbiological and sensorial changes in two different cultured species while preserving in ice conditions.

2. Materials and methods

2.1. Raw material

Sea bream (*Sparus aurata*), (average weight and length: 300 g and 220 mm) and aquacultured fresh sea bass (*D. labrax*), (average weight and length: 340 g and 240 mm) were taken from an aquaculture foundation in Egean Sea. Samples were transported to the laboratory in ice analyzed within 2 h after being collected from the cages. Whole ungutted fish were packed into insulated straffor boxes with ice in the laboratory. The ice/fish ratio was (3:1). The straffor boxes, provided with outlets for water drainage, were stored in a refrigerator. Temperature changes were determined using Testo 175-T2. Data were logged with internal probes.

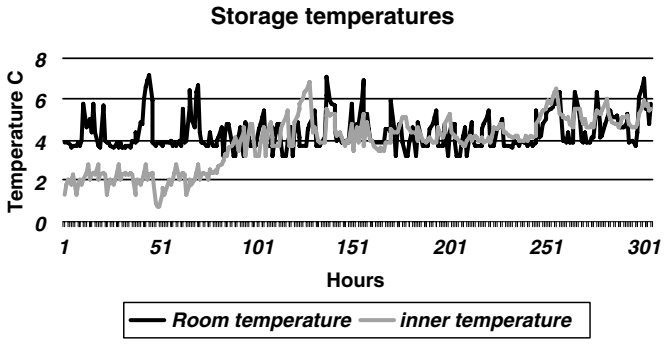

Fig. 1. Storage temperatures of the samples.

The storage temperature was 0, +5 °C. Storage room temperature and fish inner temperatures can be seen in Fig. 1.

Average and standard deviation of room temperature: 4.42 ± 0.83, fish inner temperature: 4.15 ± 1.12 °C.

2.2. Chemical quality analysis

Trimethylamine (TMA-N mg/100 g fish flesh) analysis was carried out according to the method proposed by AOAC (1984). Total volatile basic nitrogen (TVB-N mg N/100 g fish flesh) was determined according to the method of Vyncke (1996). Thiobarbituric acid (TBA mg malonaldehyde/kg fish flesh) was determined according to the method proposed by Tarladgis, Watts, Younathan, and Dugan (1960). The pH value was recorded using a pH meter (HANNA model Microprocessor). pH value was measured as described by Lima Dos Santos, James, and Teutscher (1981) using a digital pH meter (HANNA). Color measurement was carried out according to the method proposed by Schubring (2002). Water activity (a_w) values of ungutted sea bream and sea bass were measured by using TESTO 650 during the storage period in ice.

2.3. Microbiological quality analysis

The skin from the dorsal anterior area was aseptically removed using sterilised scalpels and forceps (Slattery, 1988). For all microbiological counts, 10 g of sample was taken and transferred in 90 ml 0.1% peptone water (Difco, 0118-17-0), and from this dilution, other decimal dilutions were prepared. Total viable mesophilic and psychrophilic bacterial counts were determined by the pour plate method as described by Harrigan and McCance (1976) using Plate Count Agar (Difco, 0479-17). The inoculated plates were incubated at 30 °C for 24–48 h and at 5 °C for 72 h for total viable mesophilic counts and psychrophilic counts, respectively.

2.4. Color measurement

The color measurement on fish samples trials were carried out with the spectral color meter Spectro-pen® (Dr. Lange, Dusseldorf, Germany). The homogenate was placed