Lipid Peroxidation in Silver Pomfret Muscle at 0 and 10°C

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The levels of peroxide in pomfret muscle during storage at 0 and 10°C were studied. Peroxide concentration was higher at 10°C during the early stages. After six to eight days, peroxide levels started to decrease at the higher temperature while at the lower temperature it went on increasing till the 19th day. The maximum peroxide value obtained at 10°C was much less than that obtained at 0°C.

There are many factors which affect the rate of development of peroxides in fish lipids and the subsequent reactions that they undergo. Temperature is one of the most important among them. Ke *et al.* (1977) studied the rate of formation of peroxide in frozen mackerel at -15, -30 and -40°C. They observed that the rate of formation of peroxides increased as the temperature increased. It is not known whether the same is true for other temperature ranges and other species of fish, especially the tropical water species.

The present investigation compares the peroxide formation in the lipids of silver pomfret at 0 and 10°C.

Materials and Methods

Fresh silver pomfret (*Pampus argenteus*) was obtained from the landing centre and brought to the laboratory in iced condition. Studies were carried out on two samples of different fat contents, obtained in two different seasons. The fish were filletted and minced and aliquots of mince were packed in polyethylene bags. The sealed bags were kept in ice (0°C) and at 10±1°C. Samples were drawn at intervals for analysis. Lipid content of the muscle was determined by extraction with chloroform-methanol mixture (Bligh & Dyer, 1959). Peroxide value of the lipid was determined by the modified Wheeler method (Lundberg, 1961).

Results and Discussion

Using minced muscle was found to be advantageous in such a study, the merits and demerits of which has been discussed earlier (Castell, 1971; Viswanathan Nair & Sankar, 1992). Rate of increase in peroxide concentration in two samples were studied. Sample 1 had average weight, 405 g and lipid content 3.0% and sample 2 had average weight, 773 g and lipid content 7.54%.

The increase in peroxide concentration in the two samples at 0 and 10°C is shown in Fig.1. In both the samples, peroxide concentration was higher at 10°C than at 0°C during the initial stage. At 10°C the

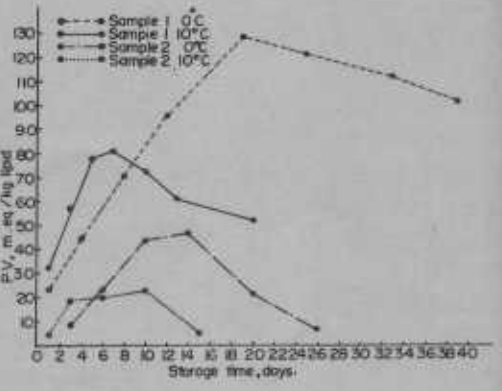

Fig. 1. Changes in peroxide value of mince from silver pomfret during storage at 10 and 0°C

peroxide formation apparently stopped after about a week. In sample 1, at 10°C, the peroxide value reached a maximum on 7th day, whereas at 0°C, peroxide value went on increasing till the 19th day and then decreased. Maximum peroxide values recorded at the two temperatures were significantly different. At 10°C the maximum peroxide value observed was 80m.eq/kg lipid and at 0°C, it was 120m.eq/kg lipid. The trend was similar in sample 2 also. In this case the peroxide values at both the temperatures were much less than that for sample 1, probably due to the effects of season and higher lipid content of the fish (Viswanathan Nair & Sankar, 1992). Thus it appears that after 6-8 days, peroxide formation was more at 0°C than at 10°C

The pattern generally expected is higher peroxide concentration at the higher temperature. But the observations in the present study was that peroxide concentration was more at the lower temperature after about 6-8 days of storage. It is not clear whether this phenomenon is due to a suppression of peroxide formation at the higher temperature or the difference in the secondary reactions that the peroxides undergo.

The effect of temperature on thiobarbituric acid (TBA) value, a closely related index of oxidative rancidity, had been studied in some detail by many workers. Lubis and Buckle (1990) had observed that in salted and dried sardine TBA values were higher at lower storage temperature. Sinhuber and Yu (1958) found that heating fish at 121°C for 30 min in autoclave caused rapid drop in TBA value. This lowering of TBA values at higher temperatures was thought to be the result of reactions of malonaldehyde with protein (Gardner, 1979; Melton, 1983). Peroxides may also undergo similar secondary reactions and the mechanisms involved at the higher temperature may be different from those at the lower temperature

The process of lipid oxidation in fish muscle involves highly complex reactions, Lipids extracted from cod muscle were readily oxidised, developing high TBA values and typical odour of rancid fish, but these highly unsaturated fat apparently did not become oxidised in the fillets during frozen storage (Castell, 1971). The explanation given by the author for this was that the lipids were oxidised, but instead of forming carbonyls and other compounds associated with rancidity, they were bound up in insoluble lipid protein complexes. This shows that the fate of the primary products of oxidation is determined by the conditions under which they are formed. The apparent lower levels of peroxides at 10°C after 6-8 days may be due to such secondary reactions taking different courses under different set of conditions.

An important aspect from the point of view of quality assessement is that storage temperature is a critical factor in determining the level of peroxides. At higher temperatures peroxide concentration may not give a correct indication of the extent of oxidation. However, it is not clear whether the trend is the same at other temperature ranges and different species.

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