Use of Catalase Value as an Index of Quality of Oil Sardine *(Sardinella longiceps)* in Ice Storage

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The amount of catalase in the tissues of oil sardine during ice storage was estimated in a series of experiments. The organoleptic quality of the muscle, as well as total plate count, the amount of bacterial catalse, trimethyl amine and total volatile nitrogen were determined side by side. Changes in the bacterial catalase values were not in agreement with the changes in bacterial count. But it has been observed that the muscle catalase values are in good correlation with organoleptic evaluation of quality of oil sardine and hence, it can be used as an index of quality of sardine during ice storage.

One of the common indices used for the quality assessment of fish is the standard plate count. However, this determination involves a minimum duration of 48 h as incubation period for the colonies to develop. Such delay may pose economic burden in terms of extended storage of raw material as well as the possible loss of a subsequent lot due to untimely corrective action. Hence there is need for more rapid techniques for assessing the quality of fish either by microbiological or chemical methods. Tomiyama *et al.* (1950) estimated the freshness of fish by determining the catalase activity of the gills. Nesterov & Stepanova (1974) determined the catalase number in fish muscle for assessing the degree of freshness of fish and used it as a supplementary test for the determination of freshness of fish. The present study was undertaken with a view to investigate whether the catalase activity of the fish muscle could be used as a supplementary test for assessing the quality of oil sardine *(Sardinella longiceps)* during ice storage.

Materials and Methods

Fresh oil sardines (*Sardinella longiceps*) landed by country carfts at Cochin were immediately brought to the laboratory and then stored in ice (1:1). Ice losses were made up by reicing on alternate days. Initial analysis of the fresh uniced sample was done immediately on arrival of the specimens in the laboratory (4–6 h after catch) and subsequent ones on successive days of ice storage which extended for 6 days.

The catalase activity in the fish muscle along with skin was estimated by the method of Herbert (1955). Muscle homogenates were prepared by grinding about 10 g of the fish muscle with 100 ml of sterile phosphate buffer (0.01M, pH 6.8) in a sterile mortar. One ml of the homogenate was used for the estimation of catalase. One ml of 0.01 N sodium thiosulphate is equivalent to 5 mol of hydrogen peroxide (H_2O_2) (Yona Yoshpe-Purer & Henis, 1976). Catalase activity was expressed as mol H_2O_2 decomposed by 1g of the muscle tissue per min at room temperature (RT). Known surface area (approximately 60 cm^2) of the fish were washed down using sterile phosphate buffer (100 ml) which carried along with it the surface bacteria and some of the soluble constituents occuring on the fish skin. Catalase activity in these washings was determined from which the catalase activity per cm^2 of the fish surface was calculated.

TMA, TVN were determined by the microdiffusion method (Beatty & Gibbons, 1957; Conway, 1947). Organoleptic scorings were carried out by cooking the muscle in 2% sodium chloride solution for 10 min. The colour, odour, flavour and texture were evaluated by the scalar system (Surendran & Mahadeva Iyer, 1970). Total aerobic plate count of the fish muscle was determined using sea water agar (SWA) giving 48 h incubation at room temperature (29 ± 1°C).

Results and Discussion

In all the three series of storage studies conducted comparable results were obtained. Results from a typical series are presented in Figs. 1 and 2. Table 1

Table 1. *Catalase activities in the skin washings and muscle of Sardinella longiceps*

Sample	Catalase activity
Skin washings	2.3*
Fish muscle along with skin	266.0**

* Expressed as mol H_2O_2 decomposed by washings from 1 cm^2 of the skin per min at room temperature.

** Expressed as mol H_2O_2 decomposed by 1g of the muscle per min at room temperature.

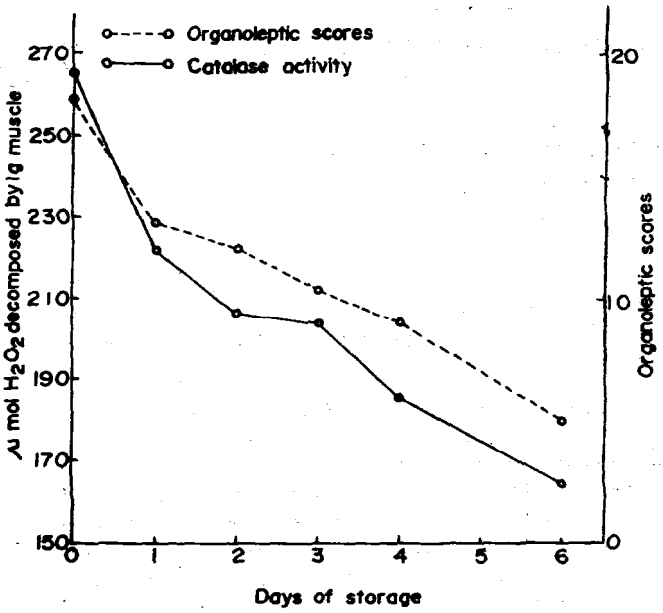

Fig. 1. Changes in catalase activity and organoleptic scores of sardines during iced storage.

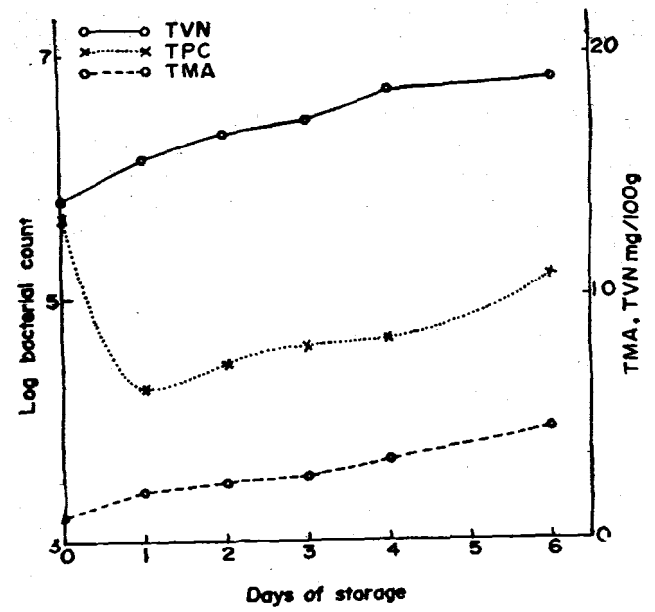

Fig. 2. Changes in TMA, TVN and TPC of sardines during iced storage.

shows the catalase activities in the skin washings and in the muscle of the fresh fish.

Fig. 1 shows that the catalase activity of the fish muscle is decreasing as the storage period increases. The activity falls from an initial value of 266 to 165 mol/g on the 6th day of storage. Parallel to this was fall in organoleptic quality of the muscle; the score falling from 19 to 5 on the 6th day of ice storage. Fig. 2 shows the TPC, TMA, TVN values, the trends of which are in accordance with those reported by other workers (Madhavan *et al.*, 1970; Surendran & Mahadeva Iyer, 1973; Hess, 1934; Kiser, 1944; Ingraham, 1958).

It is evident from Fig. 1 that the catalase activity of the muscle shows a gradual decrease concomittant with the decrease in the organoleptic score. The main source of catalase being the blood and muscle (Privol 'nev, 1950), the fall in the catalase level could be explained by the washing away of blood by the ice melt water. The catalase contributed by the associated bacteria in the iced fish was insufficient to make up this loss, though these bacteria were found to be catalase positive. However, the general fall in the muscle catalase activity and organoleptic quality show a correlation which holds promise for use of fish catalase values as an index of the quality assessment of fish during ice storage.

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