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Leaching of Protein and other Nitrogenous Compounds during Brine Curing of Mackerel

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Protein and other nitrogenous compounds were estimated in the brine and muscle of cured whole and gutted mackerel. Higher and faster loss of these compounds into the brine occurs during the initial hours of of salting in gutted mackerel than in whole mackerel. However the differences were minimal towards the end of the curing period (24 h). High values of alpha amino nitrogen were found in the cured muscle which indicated high tissue proteinase activity. The total loss of all nitrogenous compounds into brine was quite small at < 2g Nitrogen kg^{-1} fish.

Key words : Brine salting, nitrogen compound losses mackerel

Sixteen percent of the total fish landings in India is processed into dried and salt cured products (Anon, 1991). Thirty two percentage of the fish consumed in India is reported to be in the cured from (Thomas & Balachandran, 1989). Their low cost and ease of storage are the factors making cured products popular among the weaker sections of the society. Studies on the quality of commercially salt cured and dried fish of Kerala, Tamilnadu and Andhra Pradesh coasts indicate that the poor sanitary conditions in handling, production and distribution systems result in dried fish of inferior quality (Thomas & Balachandran, 1989, Kalaimani *et al.*, 1988; Basu *et al.*, 1989). However, a quantitative study on the loss of nutrients especially proteins and other nitrogenous compounds into the brine during curing of fish has not been attempted. Hence this study was taken up on leaching of nutrients during curing of mackerel.

Fresh iced mackerel (*Rastrelliger kanagurta*) in post-rigor condition brought from fish market, Cochin were divided into two batches. One batch was gutted and cleaned while the other was retained as whole. Both were immersed in saturated brine at a ratio of 1:2 (fish: brine, wt/vol). Samples of brine were taken from the two lots after initial mixing of fish and brine at 2 min and 1, 2, 4, 6 & 24 hours intervals. Total Volatile Nitrogen (TVN) and trimethylamine (TMA) by the method of Conway (1947) and alpha amino nitrogen by the EBC Ninhydrin method (EBC, 1975), were determined in 10% Trichloroacetic acid extracts of brine. Total protein was determined by the method of Lowry (1951). These parameters were also determined in the fresh as well as cured fish, where total protein was determined by the semimicro-kjeldahl method (AACC, 1976).

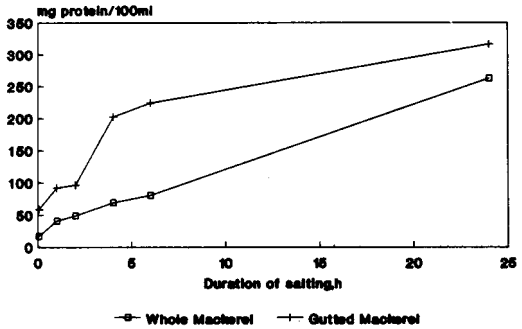

Fig. 1. Changes in protein of the brine during curing of mackerel

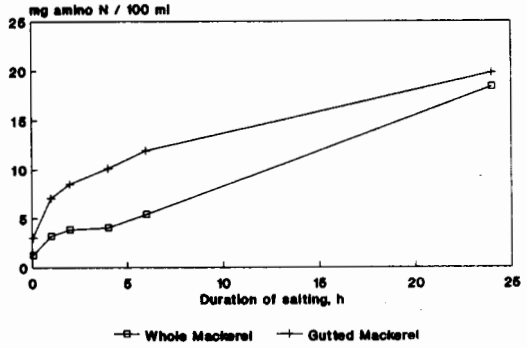

Fig. 2. Changes in α - amino nitrogen of the brine during curing of mackerel

Leaching of protein, amino N and TVN from gutted mackerel into the curing brine, was both faster and higher than from whole mackerel (Figures 1, 2, & 3). Protein and amino nitrogen from whole mackerel were leached out initially at lower rates than TVN. However, the difference in the amounts of protein, amino nitrogen and TVN leached out from both types of material became minimal at the end of 24 h of curing. As the gutted mackerel has more exposed surface area, a more rapid and higher leaching of nitrogenous constituents into the brine can be expected. As the rate of leaching was very low at the end in gutted mackerel, further losses upon extended storage of cured stock in the same brine are unlikely to be high.

The analysis of cured mackerel muscle (Table 1) showed a small decrease in protein and TVN concentration following the curing period which could be either due to pick up of salt by the muscle or by leaching of the components into the brine. However, the increase in alpha amino nitrogen after curing indicates degradation of protein as has been observed earlier (Voskresensky, 1965). This can presumably be due to the action of tissue proteinases, since microbial activity is unlikely as indicated by the relatively unaffected TVN values. Active tissue proteinases have been reported in Japanese mackerel (Matsumiya *et al.*, 1991) and the Indian mackerel (Raghunath, M.R., unpublished results).

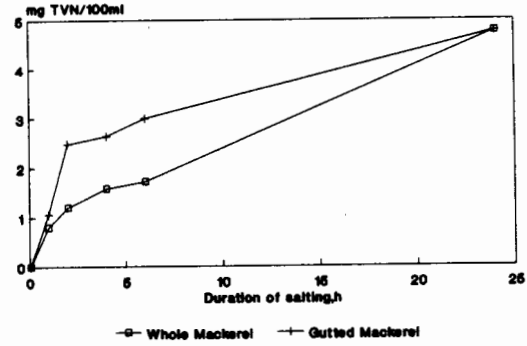

Fig. 3. Changes in total volatile nitrogen of the brine during curing of mackerel

Table 1. Changes in nitrogenous compounds in mackerel meat during salting (on dry weight basis)

Sample	Crude* protein %	α Amino nitrogen mg $100g^{-1}$	TVN mg $100g^{-1}$
Mackerel meat before brining	71.43	276.75	88.68
Whole mackerel meat brined for 24 h	70.13	297.38	65.99
Gutted mackerel meat brined for 24 h	69.33	295.51	71.20

TVN - Total volatile nitrogen
* Protein - Total nitrogenx6.25

The study thus revealed that protein and other nitrogenous compounds were lost from the curing mackerel into the brine at a faster and higher rate when the fish had been gutted. But the differences between gutted and whole fish were minimal by the end of curing period. The total loss of all nitrogenous compounds into brine was the quite small at < 2g Nitrogen kg^{-1} fish.

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