Studies on Frozen Storage of Minced Fish from Threadfin Bream

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Minced fish prepared from threadfin bream *(Nemipterus japonicus)* was frozen as blocks, packed in polythene lined waxed cartons and stored at - 23°C. The changes taking place during storage were followed. There was good correlation between the organoleptic quality, extractability of protein, cook drip loss and weight loss on thawing. The frozen minced fish was acceptable upto 28 weeks under frozen storage.

Minced fish offers a new field in the utilization of low priced fishes since minced fish is used as the base material for the production of many fish products like FPC, fish paste, cutlets, cakes, hydrolysates, fish balls, fish fingers and sausges. Many varieties of low priced fishes like cat fish, sciaenids, saurida, horse mackerel, chirocentrus, ribbon fish and threadfin bream are available from the Indian waters and the average landings of these fishes are more than 3 lakhs tonnes per year. Good quality minced fish can be produced from these low priced fishes. Considerable quantities of minced fish can be obtained from filleting wastes also.

A lot of work has been done on the production, processing, frozen storage and preparation of various products from minced fish in countries like Japan, U.S.A., U.K. and Canada. But in India very little work is done in this field. Menon & Samuel (1975) studied the production and economic aspects of marketing minced flesh from trash fish and recovery of flesh from filleting wastes. Perigreen *et al.* (1979) reported the amount of meat that could be obtained from filleting wastes of some commercially important fishes. Nakayama & Yamamoto (1977) studied the quality changes in minced fish during frozen storage. Lea & Toledo (1977) carried out work on the degradation of fish muscle during mincing and the changes in lipids during storage. Max Patashnik *et al.* (1974) recommended the use of gravity flotation method as a quality control tool and estimated the bone particle content of some minced fish muscle products. Yamamoto & Wong (1974) found out a simple chemical method for isolating bone fragments in minced fish flesh. Allan Bremner *et al.* (1978) studied the textural properties and extractable protein of minced fish.

The aim of this work was to carry out a detailed study of the frozen storage characteristics of minced fish from threadfin bream at –23°C

Materials and Methods

Threadfin bream *(Nemipterus japonicus)* were collected from CIFT research vessel. The fish were washed immediately after catch, iced and kept for one day in insulated box. After removing head and viscera, the fish were split opened, washed and the minced meat was prepared using a Baader meat picking machine. The fish mince was packed in waxed cartons (500 g) lined inside with 150 gauge polythene sheet and quick frozen in a contact plate freezer at –35 to –40°C. The frozen samples were stored at – 23°C and the changes taking place were followed.

The frozen blocks were sealed in a polythene tube and kept in running water (60 to 70 min) for thawing. The thawed meat was drained on a wire mesh for 10 min and used for the analysis. The weight loss on thawing was determined by weighing the sample before and after thawing.

The moisture, crude protein, fat and ash content of the minced fish from threadfin bream were determined by the methods of AOAC (1975), peroxide value (PV) and free fatty acid value (FFA) by the methods of Lea (1952) and AOCS (1946) respectively.

The method of Tarladgis *et al.* (1960) was used for the determination of thiobarbituric acid (TBA) value. The changes in the protein extractability were followed by the method of Dyer *et al.* (1950).

The thawed meat was cooked in steam for 10 min, cook drip drained completely, weighed and percentage cook drip loss calculated on the basis of thawed meat. Organoleptic studies were conducted by an experienced taste panel consisting of 10 members and they were asked to mark in a scale ranging from 9 to 1, 9 for extremely fresh meat, 1 for extremely spoiled meat, and 4 is the acceptability limit. The samples for the sensory studies were cooked in 2% boiling brine for 10 minutes.

Results and Discussion

The yield of minced fish from threadfin bream was 44–46% and had an attractive pinkish white colour. The proximate composition of the meat is given in Table 1. It contained 18% protein and a very low amount of fat.

Fig. 1 shows the changes in weight loss during thawing and cook drip loss. The increase in these values were significant during the first seven weeks of storage. The changes in PV and FFA are shown in Fig. 2 and TBA value in Fig. 3. The rate of change of PV and FFA values were low in the early stages of storage, followed by an increased rate, reached a maximum value and then decreased. The maximum value (12.2%)

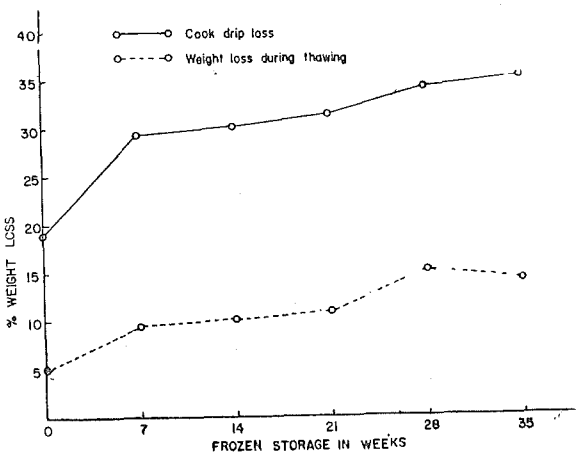

Fig. 1. Cook drip loss and weight loss on thawing frozen fish mince

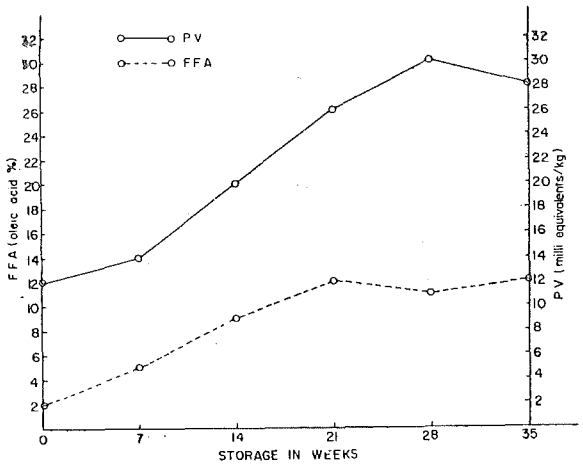

Fig. 2. Changes in PV and FFA of frozen fish mince during storage at —23° C

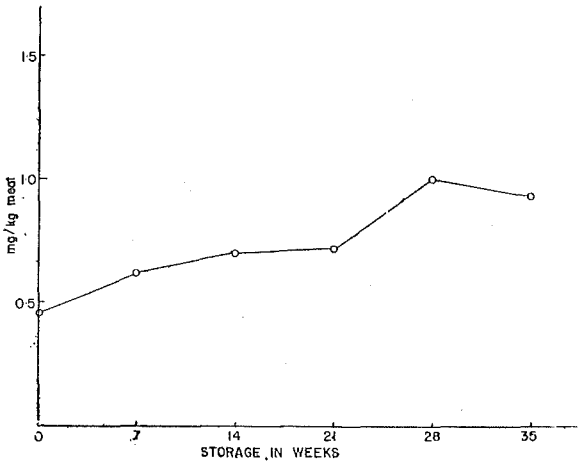

Fig. 3. Changes in TBA value of frozen fish mince during storage —23° C

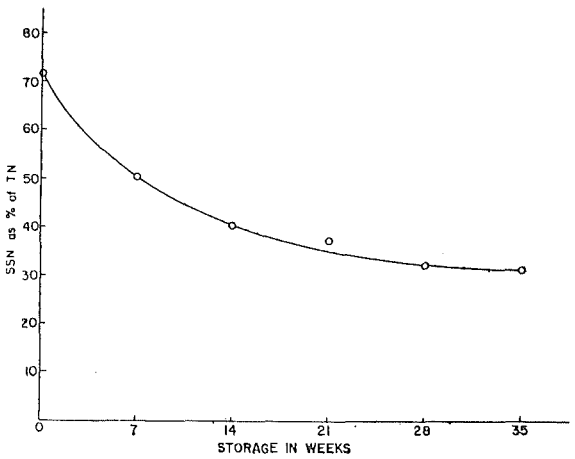

Fig. 4. Changes in protein extractability of frozen fish mince during storage at —23° C

Table 1. *Proximate composition of mince from threadfin bream*

Moisture %	80.24
Protein %	18.13
Fat %	0.72
Ash %	0.55

of FFA was reached by 21 weeks storage of the minced meat. Deng *et al.* (1977) observed in whole mullet that FFA value reached a maximum by 9 months storage. Olley & Lovern (1960) noticed a high value of FFA (25%) in cod after 40 weeks storage at – 22°C. The decrease in FFA after 21 weeks storage might be due to the interaction between free fatty acids and proteins. The interaction between free fatty acids and proteins has been reported by King *et al.* (1962) and Dyer & Fraser (1959). PV reached a maximum value by 28 weeks storage and then decreased. Nobuo Tasukuda (1978) observed that PV increased to a maximum and then decreased in frozen stored (– 20°C) minced meat from sardine. TBA values also increased upto 28 weeks and then decreased. Botta *et al.* (1973) and Nakayamma & Yamamoto (1977) reported that TBA values increased during the early stages of frozen storage of fish and then decreased. The decrease in TBA value may be due to the secondary reaction of the carbonyl compounds and volatilisation. Fig. 4 represents the changes in protein solubility during frozen storage. The changes in the solubility was considerable during the first few weeks of storage. The results of sensory evaluation is shown in Fig. 5. A considerable reduction in the score is noticed by seven weeks of storage and afterwords a gradual reduction in the score. The product was in acceptable condition by about 28 weeks.

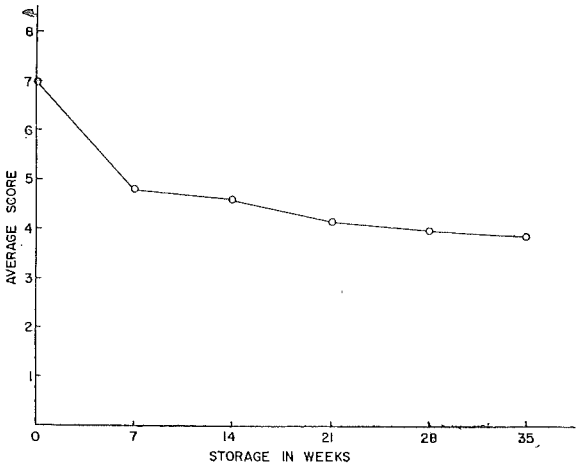

Fig. 5. Changes in organoleptic scores of frozen minced fish during storage at —23° C

There was a good correlation between the organoleptic scores, extractability of protein, cook drip loss and weight loss during thawing. The sensory scoring is influenced by textural and flavour changes. Flavour changes are related to the juiciness of the meat. Powrie (1973) pointed out the dependence of juiciness with water holding capacity. Rodger *et al.* (1979) reported that texture changes can result from the changes in the protein of the mince and the major part of solubility loss occurs during the first week of storage and that the subsequent solubility loss is very low. In the case of minced fish from threadfin bream the solubility loss was significant during the first seven weeks of storage and it was not considerable during the later stage of storage. Borderias *et al.* (1980) attributed the rapid loss of protein solubility due, perhaps, to the fact that large amount of intracellular liquid with strong enzyme activity are released during the extrusion process which induce protein denaturation.

The authors are thankful to Dr. C. C. Panduranga Rao, Director, Central Institute of Fisheries Technology, Cochin for the permission to publish the paper. The technical assistance rendered by Shri P. Sadanandan is gratefully acknowledged.

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