

KEEPING QUALITIES OF FISH DHOTHER (*POMADASYS* SPP) AND SUA (*JOHNIUS* SPP) IN FILLETED AND MINCED FORMS AT LOW TEMPERATURES

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Storage stabilities at -10° and -18° for 24 weeks were determined for fillets and minced Dhother (*Pomadasys* spp) and Sua (*Johnius* spp) fishes. Quality changes were evaluated at about monthly intervals during the storage period. Sua fish was found to be more stable as compared with Dhother. Both the species showed relatively greater stability at -18° than at -10° . In minced flesh the rate of deterioration was slightly faster than fillets irrespective of the fish species. At -10° a slight change in colour was noticed at the end of the storage in the minced products, the change being relatively greater in Dhother as compared to Sua. The results indicate that these fish species in fillet and minced form may be stored at least for 24 weeks at -10° and -18° without any serious loss of quality.

Key words: Tropical fish, Frozen storage quality, Fish minced.

Introduction

Fish are an important animal protein source in both the developed and developing countries. Fresh fish are extremely perishable commodities and spoil readily at ambient tropical temperatures.

In Pakistan, only a small fraction of the total (over 0.35 million tons) catch is economically utilized which earns about 100 million rupees in foreign exchange. This is achieved through the export of shrimp and a small quantity (37,306 in tons) of fish [1].

Freezing is perhaps the best method for fish preservation. However, most of the studies on frozen storage of fishery products were confined to cold water fish species [2-5]. Relatively less published information is available on the frozen storage stability of tropical fish [6,7].

The present study was carried out to examine changes occurring during frozen storage and the stability of two commercially important fish namely Dhother (*Pomadasys* spp) and Sua (*Johnius* spp). It may be expected that minced meat made from these fishes could be a source of cheap proteins for human consumption and could be incorporated into traditional and non-traditional secondary products.

In the present paper attention is focussed on the sensory and biochemical changes that occur in minced and filleted fish during frozen storage at -10° and -18° . These parameters were employed to assess the storage stabilities of the fishes at these temperatures.

Materials and Methods

Collection and preparation of samples. Harbour fresh Dhother (*Pomadasys* spp) and Sua (*Johnius* spp) were obtained from the Karachi fish harbour. The fish were

harvested 3 days prior to landing and were held in ice during transit. The fish weighing between 2 and 3 kgs. were wrapped in polythene bags together with sufficient ice till transported to the laboratory, where they were be-headed, eviscerated and washed thoroughly to remove blood and slime.

The dressed fish were filleted and skinned. A homogeneous sample of minced flesh was obtained by finely chopping a portion of the fillets in a mechanical mincer at 0° . The mince was immediately packed in small polythene bags. Portions of 100g minced flesh were placed in each polythene bag. Fillets weighing about 100g each were also wrapped in the same manner. The polythene bags containing fish flesh were packed in a waxed carton and frozen in a blast freezer (at -30° for 4 hours). The samples were then stored at $-10^{\circ} \pm 2^{\circ}$ and $-18^{\circ} \pm 2^{\circ}$ in frozen storage cabinets for 24 weeks.

Samples were also taken from each species for initial compositional analyses. For the assessment of quality, samples were removed from storage at 4 weeks interval and thawed at 5° in a refrigerator before analysis.

Organoleptic Assessment. The sensory changes in the samples at known intervals were evaluated by a panel of three judges.

ANALYTICAL PROCEDURES: Analysis of gross composition. To assess the gross composition of fish, flesh representative samples were analysed for moisture, ash, protein and lipid in a composite of six samples. The analyses of trimethylamine (TMA), total volatile bases (TVB), thiobarbituric acid value (TBA), and salt soluble protein (SSP) were performed in duplicate.

Biochemical Analysis. TVB-N was determined according to the method of Cobb *et. al.* [8], (TMA-N) was estimated by Dyer's picric acid procedure [9] modified by Hoogland [10].

TBA values were determined by the method of Tarladgis *et al.* [11] using 10g samples. SSP was determined by the procedure of Dyer [12] and Snow [13]. Protein (N x 6.25), ash and moisture were determined according to AOAC procedures [14,15]. Lipid was extracted by the Bligh and Dyer [16] method.

Results and Discussion

Composition of the Fishes. Average composition of flesh of fish Dhothar (*Pimadasys spp*) and Sua (*Johnius spp*) are presented in Table 1. The percentage of moisture, protein, fat and ash are within the ranges reported for other pelagic tropical fish [17].

The changes in colour and odour during storage are recorded in Table 2. Organoleptic examination showed that there was no apparent change in the odour throughout the storage period at both the temperatures. The odour may be described as characteristic of fresh fish persisted upto 24 weeks of storage, both in fillet and minced flesh of the fish samples. Slight colour changes in the samples were observed after 24 weeks of storage at -10°. The fillets developed slightly

dirty yellow colour whereas slightly brown reddish colour was produced in minced flesh. It is clear that both fish species may be stored in acceptable condition in fillet or minced form upto 24 weeks in this temperature range.

Changes in total volatile bases nitrogen (TVB) are presented in Fig. 1. The TVB-N levels showed an increase reaching from an initial value of 1.14 mg/100g to 10.4 mg/100g and 12.0 mg/100g respectively in fillets and minced flesh of Dhothar at -10°. The corresponding values of Sua

TABLE 2. ORGANOLEPTIC CHANGES IN FISH FILLETS AND MINCE DURING FROZEN STORAGE.

Storage Time of Storage (Weeks)	Storage temperature -10°C	Storage temperature -18°C	Comments
	Sua and Dhothar minced and filleted	Sua and Dhothar minced and filleted	
4	No apparent change	No apparent change	Characteristic fresh odour and colour
12	"	"	"
16	"	"	"
20	Very slight dirty yellow colour in fillets and very slight brownish red colour in minced of both Dhothar and Sua.	Fresh odour, very slight dirty yellow colour both in Dhothar and Sua at -18° and very slight brownish red colour in mince of both fishes.	acceptable
24.	Slight dirty yellow colour in fillets and slight brownish red colour in mince of both Sua and Dhothar.	Slight dirty yellow colour both in Dhothar and Sua at -18° and slight brownish red colour in mince of both fishes.	acceptable

TABLE 1. GROSS COMPOSITION OF SUA AND DHOETHER.

		Sua			Dhothar		
		Mean	±	SD	Mean	±	SD
Moisture	g/100g	79.0	±	1.2	78.2	±	1.13
Ash	g/100g	1.145	±	0.16	1.21	±	0.12
Protein	g/100g	16.601	±	1.12	18.95	±	1.12
Lipid	g/100g	0.368	±	0.11	1.095	±	0.14
TMA-N	mg/100g	0.11	±	0.03	0.1	±	0.06
TVB-N	mg/100g	1.2	±	0.02	1.14	±	0.018
TBA value	mg/1000g	0.1835	±	0.001	0.183	±	0.011
SSP	g/100g	9.4	±	0.32	10	±	0.39

No. of composite samples analysed six

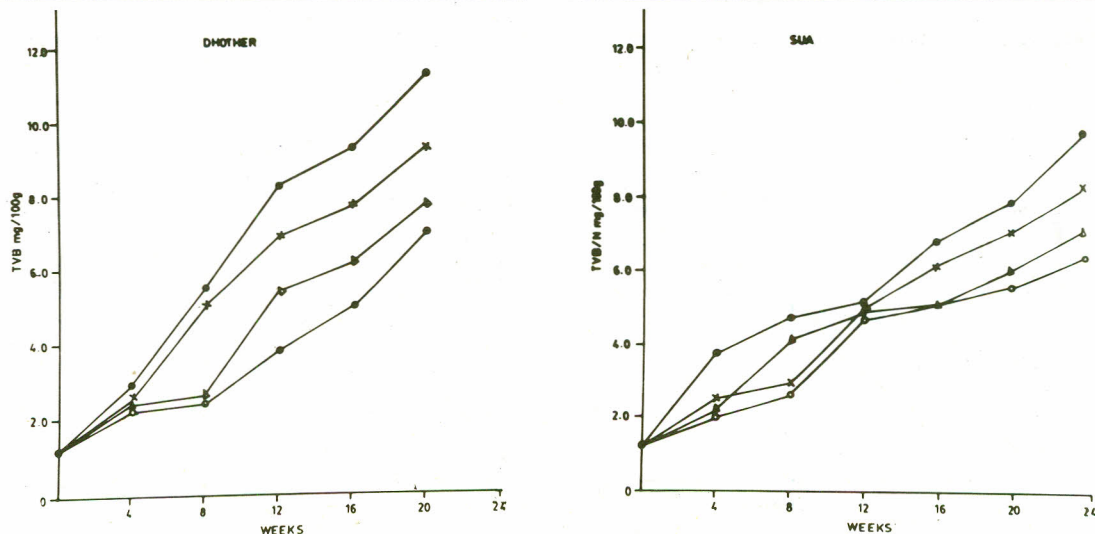


Fig. 1. Keeping quality of fish Dhothar (*Pimadasys spp*) and Sua (*Johnius spp*) in filleted and minced forms at low temperature.

were similar. The values reached to 8.2 mg/100g and 9.6 mg/100g from an initial value of 1.2 mg/100g in fillets and minced flesh respectively.

At -18° the increase was relatively slow reaching from an initial value of 1.14 mg/100g to 8.0 mg/100g in fillets and 9.2 mg/100g in minced flesh of Dhother. The values at -18° reached to 6.3 mg/100g and 7.3 mg/100g in fillets and minced flesh of sua respectively from an initial value of 1.2 mg/100g.

The value of TVB 35-40 mg/100g of flesh may be taken as an indication of acceptability of fish [18]. Fish samples were well below the limit throughout the storage at these temperatures.

The production of TMA-N (Fig. 2) followed a pattern similar to that of TVB-N. It also showed a slow increase with the time of storage. The TMA increased to 4.4 mg/100g from an initial value of 0.12 mg/100g in fillets and 5.3 mg/100g in minced flesh of Dhother at -10°. In Sua the values reached to 4.3 mg/100g from an initial value of 0.11 mg/100g in fillets and 4.9 mg/100 in minced flesh respectively. At -18° the value

of TMA reached to 4.55 mg/100g and 4.8 mg/100g of fillets and mince of Dhother respectively. In Sua the corresponding value reached to 3.2 mg/100g and 3.7 mg/100 of fillet and minced flesh respectively from an initial value of 0.11. In both the fish samples it seems that the minced flesh deteriorates faster than fillets. TMA-N however, remained below 6.0 mg/100g throughout the period of storage at both the temperatures.

It is generally accepted that the production of TMA in fish is brought about exclusively by bacteria. The increase in TMA was found at -10° and -18° where the growth of bacteria is unlikely. TMA formation, therefore, could not be attributed to bacterial activity. The specific explanation may not be given from this study. However, an increase in TMA has been reported by Castell *et. al.* [19] in frozen cod fillets under conditions where bacterial activity could not take place.

Figure 3 shows the change in TBA values in fillets and minced flesh of Dhother and Sua at -10° and -18°. Both fatty and low fat fishes have a major problem of lipid oxidation

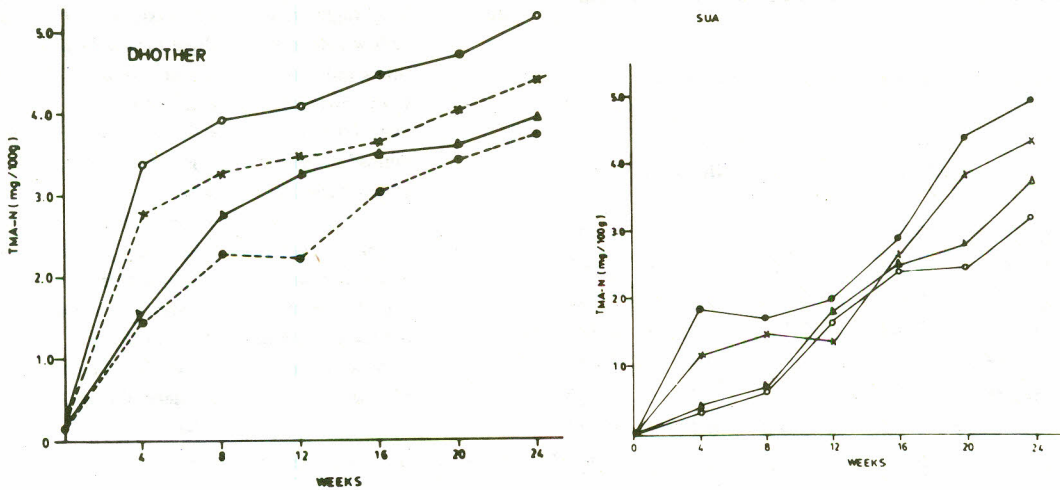


Fig. 2. Keeping quality of fish Dhother (*Pamadosys spp*) and Sua (*Johnius spp*) in filleted and minced forms at low temperature.

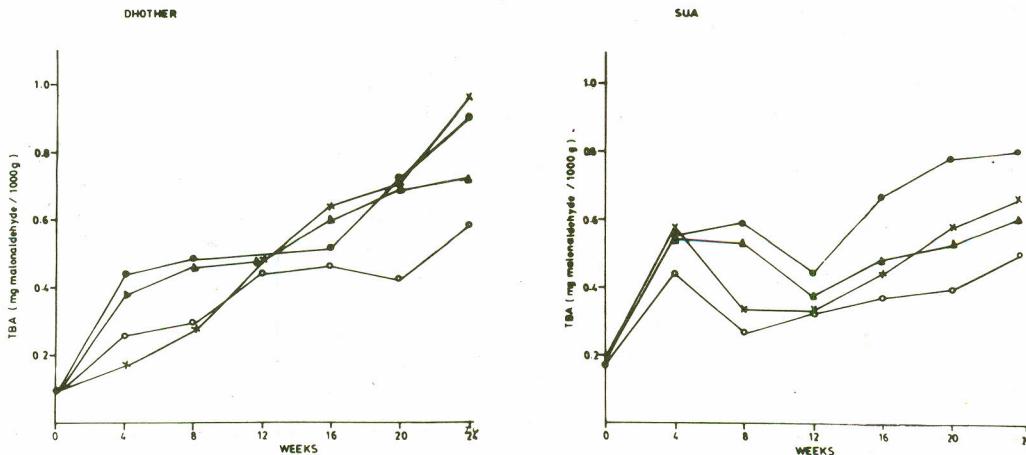


Fig 3. Keeping quality of fish Dhother (*Pamadosys spp*) and Sua (*Johnius spp*) in filleted and minced forms at low temperature.

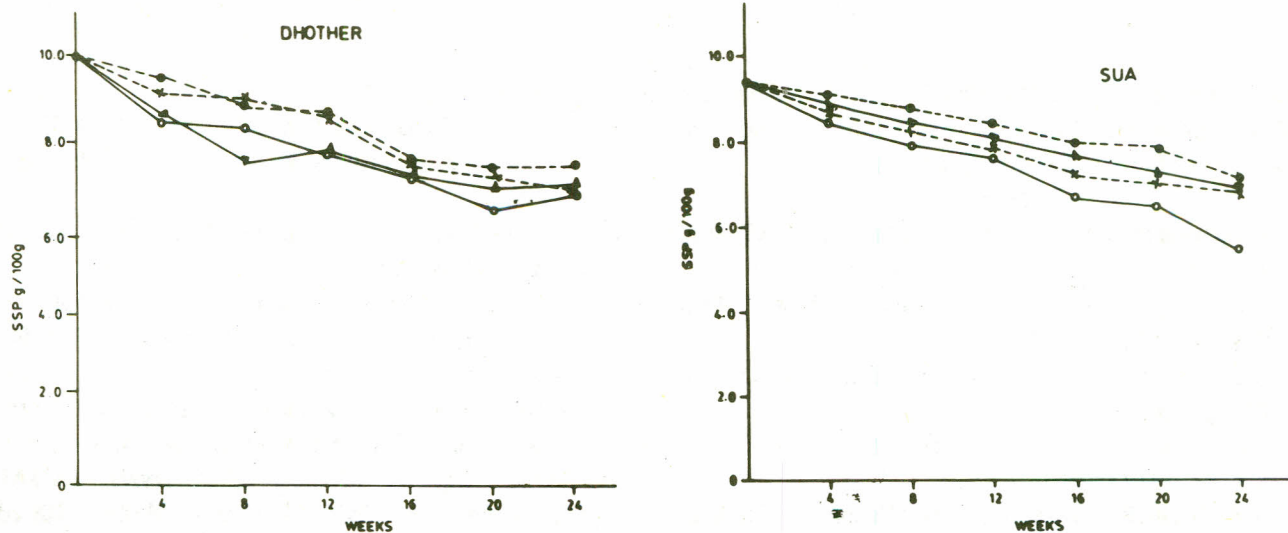


Fig. 4. Keeping quality of fish Dhother (*Pamadosys* spp) and Sua (*Johnius* spp) in filleted and minced forms at low temperature.

particularly when stored as minces [17]. The TBA values increased to 0.95 mg and 0.9 mg/1000g from an initial value of 0.083 mg/1000g at -10° in fillets and minced flesh of Dhother respectively. At -18° the increase in Dhother was relatively slow reaching 0.58 mg/1000g and 0.72 mg/1000g from an initial value of 0.083 mg/1000g in fillets and minced flesh respectively.

The corresponding values of Sua were similar. The values reached to 0.66 mg/1000g and 0.78 mg/1000g from an initial value of 0.182 at -10° in fillets and minced flesh respectively.

At -18° the values reached to 0.45 and 0.6 mg/1000g from an initial value of 0.182 in fillets and mince of sua, respectively. TBA values of over 3 are considered as upper limit for good quality of fish [20]. The low TBA values (max. 0.95) obtained during this study showed that oxidative rancidity may not be a problem during frozen storage at these temperatures. The TBA values were higher for minces as compared to fillets.

Changes in SSP during storage are presented in Fig. 4. The salt solubility of protein (SSP) value is accepted as a measure of protein denaturation and mince quality [21,22].

In frozen fish the solubility of the muscle protein has been widely used as a measure of cold storage protein denaturation [23]. The SSP value decreased with a faster rate in minced flesh than fillets of the stored fish both at -10° and -18° . In Dhother fish the values decreased from 10.0g/100g to 7.0g/100g in fillets and from 10.0g to 6.8 g/100g in mince at -10° . At -10° the corresponding decrease from 9.4g/100g to 6.8 g/100g and from 9.4 g/100g to 5.4 g/100g was obtained for fillets and mince of Sua respectively. At -18° the corresponding value of SSP were 7.5 g/100g and 7.1 g/100g from an initial value of 10.0 g/100g of fillets and mince flesh of Dhother respectively. In Sua the corresponding values

decreased from 9.4 g/100g to 7.05 g/100g and 6.8 g/100g in fillets and mince respectively. The decrease in SSP values was slow in fillets than the mince at the two temperatures of storage. A decrease in SSP during frozen storage has been reported for various fishery products [6].

Conclusion

Storage stabilities of Sua and Dhother at -10° and -18° were determined to ascertain the acceptable shelf life of the fishes at these temperatures. A frozen storage at -18° (0°F) or below is considered desirable for minimizing the cold storage deterioration of many perishable foods including fishery products. This temperature is, however, difficult to maintain in commercial retail handling of fishery products. It is reasonable to assume that a storage temperature of -10° would be easier to achieve during retail trade. The results of this study clearly demonstrate that both Dhother and Sua in fillets and in minced flesh forms could be stored atleast for 20 weeks without any loss in quality.

Similar to the findings of this study, Dyer and Morton [24] found the acceptability of plaice, cod and Atlantic halibut fillets for approximately 6 months, 2-3 months and 8 months respectively at -12° . Dyer [25] also found that the acceptable storage life of frozen cod fillets was 6 to 8 months at -17.8° and 9 to 10 months at -23.3° . In view of the wide possibilities for use of mince fish in the preparation of secondary products more studies are needed to assess the stabilities of tropical fish in the minced form. At present, processed fish is unknown in Pakistan. People prefer to buy whole fish. This study was confined to the storage stability of fillets and minced fish, no attempts were made to study the stability of round fish because people will prefer the convenient forms over whole eviscerated fish.

However, modern facilities for preparation of mince fish

in this country are limited. It is, therefore, suggested that low cost and abundantly available varieties of fish could be preserved in filleted rather than minced form.

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