

## IMPROVEMENT IN QUALITY AND STORAGE LIFE OF PICKLED FISH BY MEANS OF PROPIONIC ACID

by

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### ABSTRACT

The chief indigenous pickling method called the Colombo cure has been compared to a chemical method developed by the authors using propionic acid and the latter was found to give a better product with longer storage life.

### INTRODUCTION

Pickling of fish under saturated brine is carried out in India in a modified form known as the Colombo process employed for mackerels, seer and nonfatty sardines. The industry is located mainly on the Malabar-South Kanara coast and the products sealed in barrels are mostly exported to Ceylon, Malpe being the chief exporting centre. The rationale of the method consists in rendering the brine acidic by rubbing into the gutted and washed fish along with salt dried pods of an acidic fruit, *Garcinia cambogea*, popularly known as "gorakapuli". These heavily salted fish are left in large cement tanks for some weeks and later packed in air-tight barrels under brine for export (Nicholson, 1930). It was also observed that several curers all along this coast preserve bulk catches of fish under saturated brine in cement tanks themselves with or without the addition of gorakapuli. Mold growth, reddening etc., are fairly common especially in the exposed products.

While attempts to improve the process have been in progress in recent years (Suryanarayana Rao *et al*, 1958; Vasavan and Varma, 1959) the present authors have recently revealed the usefulness of propionic acid as a preservative for cured fish products (Valsan *et al*, 1961). Subsequent work dealing with the pickling of fish in saturated brine alone under temperate conditions

showed that brining is ineffective unless the fish are pre-treated with propionic acid. It was therefore proposed to compare this chemical method with the indigenous method using gorakapuli or its substitute, tamarind (*Tamarindus indica*) employed by the authors in earlier experiments.

### EXPERIMENT

100 fresh mackerels, gutted, split dorsoventrally and washed, were grouped into four lots and cured as follows:

- (a) 25 fish were dipped in 4% propionic acid for 10 minutes and salted in 1:3 ratio.
- (b) 25 fish were merely salted without propionic acid treatment to serve as control.
- (c) 25 fish were also salted similarly but a small piece of 'Gorakapuli' was rubbed into each fish along with salt. Total quantity of 'Gorakapuli' used amounted to 5% of the weight of fish.
- (d) The last batch of 25 fish were cured as under (c) substituting tamarind for Gorakapuli.

After keeping overnight in mud pots, more brine was added the next day to cover the fish and the products transferred to stoneware jars after 4 days and covered with fresh saturated brine.

The products were examined chemically in the fresh and stored condition while their organoleptic condition was checked by routine observation. The fish were also

examined by a taste panel in the freshly cured state.

Results of these investigations are shown in Table I.

TABLE I  
*Observations on the Chemical and Organoleptic Condition of pickled Mackerels*  
(Moisture content of samples 52.01 to 57.81%; Salt content 14.0 to 15.82%)

Nature of Brined Product.	One month old samples		After 3 1/2 months of storage		Taste Panel Score	Time of onset of spoilage in number of days.		
	TVN mg %	FTN mg %	TVN mg %	FTN mg %		Moulds	Red Halophiles	Putrid Odour.
Control (Brine alone)	19.56	58.06	63.49	169.1	spoiled	20	28	20
Gorakapuli treated	4.09	24.17	18.05	72.54	12	46	65	63
Tamarind treated	8.56	61.37	32.49	112.9	9	46	65	63
Propionic Acid treated	3.65	27.13	11.01	86.78	18	146	157	130

#### DISCUSSION OF RESULTS

It may be observed from the present study that a dip in propionic acid is more efficient than the addition of acidic fruits like gorakapuli and tamarind. Spoilage by moulds and red halophiles is delayed and overall shelflife is improved by double the period. It is plausible that the lower storage life of all the products is due to their exposed condition. Since fish packed in barrels are reputed to keep upto one year, the present method of propionic acid pre-treatment appears to be particularly useful for fish stored in open tanks as practised on an extensive scale on the West Coast. Brining alone is very ineffective. Results of chemical examination confirm organoleptic findings by showing lower total volatile nitrogen and formal titrable nitrogen (FTN) levels in propionic acid treated fish. Taste panel result is also encouraging as seen from the Table. It is therefore possible that although the Colombo cured mackerel are not popular in the

internal markets, modifications on present lines may promote a greater appeal.

Distinct preservative action of propionic acid is indicated by considering the pH of these products. Chemical treatment (with propionic acid) reduces the pH to 5.0 while gorakapuli gives a pH of 5.4 and tamarind, pH of 4.8. Judging from the relative onset of spoilage symptoms there does not appear to be much advantage in using gorakapuli over tamarind. However although the time of onset of spoilage is the same in both cases intensity of mold growth and reddening was found to be less in gorakapuli products in the initial stages. The same is reflected in the chemical data. Taste panel score is also higher for the indigenous method. On the whole preservative action of gorakapuli appears to be mainly due to pH lowering as suggested by Sreenivasan and Venkataraman (1957).

While further work on the preservative action of gorakapuli is no doubt necessary,

it is worthwhile to pursue the promising results observed with propionic acid to evolve suitable methods of pickling under tropical conditions. Propionic acid is a safe chemical (Harshberger, 1942) and its use is already legalised in many countries in the bakery industry.

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#### REFERENCES

- Harshberger, K.H. (1942): *J. Dairy Sci.*, 25: 169.
- Nicholson, F.A. (1930): *The Preservation and Curing of Fish*, Govt. Press, Madras.

- Sreenivasan, A. & R. Venkataraman (1957): The Bacteriology of Indian Curing Salt and Brine Cured Fish. *Proc. 2nd Int. Symp. Food Microbiol.*, pp. 117-120.
- Rao, S.V.S., A.P. Valsan & M.R. Nair (1958): Studies on the Preservation of Fish by Pickling. *Ind. Jour. Fish.*, 5 (2): 326-340.
- Valsan, A.P., M.R. Nair & S.V.S. Rao (1961): Propionic acid as a preservative for cured fish products. *Jour. Sci. Ind. Res.*, 20D (9): 351-354.
- Vasavan, A.G. & K.G. Varma (1959): Experiments on pickling fish with Vinegar and Malabar tamarind. *Curr. Sci.*, 28: 153-154.