

## A SIMPLIFIED METHOD OF PICKLING MACKEREL USING PROPIONIC ACID

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Even though preservation of fish by commercial pickling has not attained the magnitude as in European and Scandinavian countries, yet it has been practised on a fairly large scale along the west coast of India. The well known Colombo method of curing is one of the typical examples of commercial pickling practised in India (Nicholson, 1930). Similarly the curers of west coast often process fishes like mackerel by stacking them under pressure with a high ratio of salt in big cement tanks, without letting out the self brine. Sometimes these fishes will have to remain in pickle for months together and very often it could be seen that the surface layers are covered with a scum of mould and 'red'. Even if the product is not completely spoiled, they usually fall short of the expected quality standards.

In both these processes the fish tissue is likely to absorb too much of salt imparting a disagreeable saltish flavour to the product. Use of high proportions of salt also adds to the cost of treatment of fish. On account of the latter fact alone curers have a tendency to minimise the quantity of salt used for curing operation, which might be partially responsible for the poorer quality of the finished product and the lowering of its shelf life.

Valsan *et. al.* (1961) and Rao *et. al.* (1962) have reported that fishes like mackerel could be successfully pickled and preserved for a long period by giving them a predip in a propionic acid bath of appropriate strength, followed by the usual procedure of heavy salting in 1:3 ratio (salt : fish). Rao and Valsan (1962) in their attempts to modify the pickling process have shown that mackerel after the usual method of heavy salting can be effectively preserved in saturated brine containing 0.25% or 0.5% of propionic acid. The two modifications however effected only an improvement in the storage characteristics and not in the production cost. The present paper reports results of investigations carried out to further simplify the procedure for pickling mackerel so as to make the handling of bulk landing of mackerel more easy and cheap.

### EXPERIMENTAL

Freshly landed mackerel of size 18 to 22 cm. were gutted, dorsoventrally split, washed and transferred to four glass jars containing saturated brine alone (control) and saturated brine fortified with 0.25%, 0.5% and 1.0% propionic acid respectively. Each of the above lot consisting of 15 fishes required about 2 litres of brine solution. Though initially the fishes had a tendency to float on the surface, within four to five days all of them except the control settled down to the bottom. The bottles were closed and kept for storage studies at room temperature conditions. As a departure from the normal practice, it may be noted that no presalting was done nor was any excess salt added to strengthen the brine.

The products were examined periodically to assess the general organoleptic condition, development of mould growth and red halophiles. Chemical examination was also carried out

by standard procedures (Suryanarayana Rao *et. al.* 1958). Total volatile fatty acid estimation has carried out by A.O.A.C. method (1955). Taste panel studies were also conducted by a body of experienced observers.

### RESULTS

As was observed on many previous occasions, it was found that mackerel put in brine without any propionic acid additive began to show distinct signs of spoilage even within the first two days. During the first week itself they had to be discarded because of strong putrid smell and the disintegration of the tissues. The brine also became turbid and discoloured. The fishes pickled in brine fortified with 1% and 0.5% concentrations of propionic acid continued to remain in good condition even after a storage period of over an year. The fishes also retained bright and attractive appearance and shape. The fishes pickled in 0.25% propionic acid brine were found in a sound condition up to 5 to 6 months, after which a slight scum of fungus began to develop on the brine surface and on the fishes exposed out of the brine. Even at this stage the fish was still in an acceptable condition.

In the taste panel studies conducted from the standpoint of sensory evaluation for acceptability for the purpose of comparing these products, it was found that the fish pickled in 1% propionic acid brine had a distinct sour taste and an acidic flavour, which were not relished. The product from 0.25% propionic acid pickle had the best taste closely followed by the product from 0.5% propionic acid pickle. On one occasion the products obtained by this direct pickling method was compared with the product obtained by the previous method of presalting and later pickling in propionic acid brine. However the panel unanimously preferred the product from direct pickling method to those obtained by the previous method.

The chemical analysis data are presented in Table I. In the case of direct pickled mackerel the values are those obtained after a storage period of five months, when the products are sufficiently "struck" by salt and preservatives. For comparison some typical analytical value ranges for colombo cured mackerel and mackerel presalted and pickled in propionic acid brine (stored for the same period) are also presented side by side. The values indicate that the moisture content of the sample of the new method come down only to 62% whereas

TABLE I  
Chemical Composition (Original wt. basis)

Product analysed	moisture %	salt %	T.m.V.B. mgm N%	T.V.F.A. as pro- pionic acid %	pH of Brine solution	
					Before pickling	After pickling
Fresh mackerel	74.87	0.14	15.23	..	..	..
Presalted and pickled in 0.5% p. acid brine.	50-60	12-16	12-70	..	..	4.35
Colombo cured commercial samples	49-57	11-16	18-132	..	..	5.1-5.4
Directly pickled in brine containing 0.25% p. acid.	61-65	15.52	22.2	0.17	3.0	5.1
Directly pickled in brine containing 0.5% p. acid.	61.97	15.27	19.56	0.20	3.5	4.9
Directly pickled in brine containing 1.0% p. acid.	61.83	14.84	18.6	0.63	3.3	4.7

in presalting method as well as in colombo cure method the fish undergoes more drastic dehydration of 60 to 49%. On account of this, the direct pickled fish does not wrinkle or shrink too much and hence remains more akin to fresh fish with a wholesome bright appearance and soft texture. The salt content of the fish is fairly high, about 15 to 16%. The total volatile nitrogen of the product was between 19 and 22 mg%, which sufficiently vouches for the good condition of the product. The total volatile fatty acid figure given in the table is partly contributed by the added propionic acid as well as those normally produced when fish is in storage. In the case of 1% pickle the T.V.F. value is a little too high. The values in the other too are well within the prescribed limits.

Taking organoleptic, taste panel and chemical factors into consideration, it may be concluded that 1% propionic acid level is too high for the pickling brine and that 0.5% is sufficient to keep the fish in a good condition for an extended period of storage of not less than a year in the direct pickling method. However giving credence to taste panel evaluation and to bring down the cost of treatment, 0.25% p. acid in saturated brine could also be conveniently used, in cases where storage life is not required to be over 5 months. In commercial bulk pickling using this simplified method it will be advisable to throw in a little extra salt along with the fish (say in 1:4 ratio) into the saturated brine pickle bath, as a safeguard that the brine strength may not drop far below the saturation level due to the excessive dumping of fish in limited quantity of the pickle solution. An occasional churning up of the pickle will also help to keep the brine strength of the pickle uniform.

#### SUMMARY

A highly simplified method of pickling mackerel by directly dumping split fish into saturated brine fortified with 0.25 and 0.5% propionic acid is described. By this method handling of heavy glut season landing of mackerel is made more easy, efficient and economic. The merits of the method over traditional salt pickling and colombo method of curing are discussed.

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