A FERMENTATION PROCESS FOR THE PRODUCTION OF QUALITY FISH MEAL

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MATHEW, NAIR AND RAMAKRISHNAN[1] observed that the fishy odour of shark liver oil is completely removed as a result of agitation of the oil with fermenting milk for 36 hours. This suggested the possibility of preventing the development of rancidity in fish meals by the treatment of the raw material with fermenting milk.

A number of experiments were conducted in which minced flesh from different fishes was treated separately with small quantities of buttermilk (after defatting) and the final products examined for their keeping qualities. Surprisingly enough, the analyses of the different samples of the fish meals showed that under certain conditions the oil content of the fish is considerably reduced in the final product, and that the meals did not develop the characteristic rancid odour of the untreated fish powder even after keeping in glass bottles for over 9 to 10 months. The details of the process are as follows:

The fish after removal of viscera and scales is minced well in a meat mincer. The required quantity of defatted buttermilk (about 1 oz. to 6 lb. of minced flesh) is added and the whole material is mixed thoroughly with the minimum quantity of water. The pH is maintained between 4·5 and 5·0 and the temperature is raised to about 30-35° C. by keeping the container in the sun or in lukewarm water. The reaction is allowed to continue for about 4 hours with constant stirring. The material is pressed afterwards in cloth bags and dried in the sun.

The final product is found to have a better appearance than the simple sun-dried and powdered sample and is as good as the products obtained from the wet reduction process.

For detailed study and comparison, meals were prepared by the following three different methods: (1) simple sun-drying and powdering, (2) cooking, pressing, drying and powdering, and (3) fermenting, pressing, drying and powdering. Five different species of fish have been tried, *viz.*, *Sardinella albella*, *Sardinella gibbosa*, *Ilisha brachysoma*, Rays and shark (*Carcharinus* sp.). Samples of fish meal obtained from these species were analysed for their mositure, fat, total and water-soluble protein contents. The results are presented in Table I.

TABLE I

Analysis of fish meal

Name of fish from which meal is prepared		Moisture %	Fat %	Total-N %	Protein (N×6·25) %	Water-soluble protein % of total-N
Sardinella albella	*a*	6·1	9·8	..	..	..
do	.. *b*	7·0	3·7	13·30	83·13	5·0
do	.. *c*	6·4	4·1	14·35	89·68	15·6
do	.. *d*	8·3	1·4	..	..	..
Sardinella gibbosa	*a*	6·4	10·1	11·90	78·38	17·6
do	.. *b*	9·8	6·0	13·50	84·38	6·2
do	.. *c*	5·8	6·2	14·00	87·50	10·0
Ilisha brachysoma	*a*	7·2	7·1	..	..	..
do	.. *b*	6·8	4·1	12·95	80·94	6·0
do	.. *c*	9·0	3·4	13·30	83·13	10·5
Shark	.. *a*	7·2	1·8	14·00	87·50	18·5
do	.. *b*	5·3	0·8	14·94	93·38	6·8
do	.. *c*	5·8	0·6	15·08	94·25	18·2
do	.. *b*	8·4	0·6	14·78	92·38	5·9
do	.. *c*	9·2	0·3	14·50	90·63	14·2
Ray	.. *a*	9·2	3·2	..	..	..
do	.. *b*	9·9	1·3	14·35	89·68	9·8
do	.. *c*	7·6	2·2	14·35	89·68	16·1

* *a*—Simple sun-dried and powdered; *b*—Cooked, pressed, dried and powdered; *c*—Fermented, pressed, dried and powdered, *d*—Solvent extracted, dried and powdered.

It may be seen from the table that in samples obtained by the fermentation method there is a considerable reduction in the oil content, both in the oily varieties such as *Sardinella albella* and *Sardinella gibbosa* and the non-oily fishes like sharks and rays. The rate of reduction of fat is quite comparable to that obtained in the cooking process although it is not found as efficient as solvent extraction. From the values for the protein contents of the fish meals it must be presumed that the treatment does not materially affect the amount of protein. It is quite likely that in the fermentation process the bacterial action induces some sort of zymolysis of the fat component of the fish flesh and it is disrupted and simplified without impairing the proteins.

The water-soluble protein contents of the fermented samples also provide some interesting results. The percentage of this component in the product obtained from the fermentation process is seen to be nearly equal to that found in the simple sun-dried product. As against this, in the product prepared by the conventional method of cooking the major portion of water-soluble proteins is removed.

The above preliminary observations indicate that the fermentation process may be adopted to advantage for the preparation of good quality fish meal from both fatty and lean fishes. The appearance and the quality of the product obtained from shark and other cheap fish flesh also suggest the possibility of preparation of odourless 'Fish Flour' from these varieties by this method. The method has many advantages over the traditional methods in that elaborate cooking arrangements and the use of costly solvents are avoided, ensuring at the same time a good quality fish meal. But since the fat in the fish is believed to be disrupted as a result of the reaction it may be best suited in cases where the recovery of oil from the flesh is uneconomic.

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1. Mathew, P. K., Nair, P. V. and Ramakrishnan, T. A., *Proc. Ind. Sci. Cong.*, 1949, Part III, Abst., 101.