STUDIES ON ANALYTICAL METHODS OF EXTRACTING VITAMIN A AND OIL FROM FISHERY PRODUCTS

PART IV - EXPERIMENTS ON THE EXTRACTION OF LOW-OIL-CONTENT LIVERS WITH ACETONE, ETHYL ETHER, AND PETROLEUM ETHER

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This report presents data on further experiments (Sanford and Karrick 1950) carried out with a view toward development of improved methods for extracting oil and vitamin A from low-oil-content fish livers. The rockfish (Sebastodes sp.) livers used in the experiments reported here were from the same batch employed in the earlier series.

Table 1 - The Apparent Concentration of Oil in Varied-Weight Samples of Low-Oil-Content Liver Determined By Means of the Shaking Method with Acetone as the Solvent[1]

Approximate weight of liver sample	Apparent concentration of oil in liver				
	Replicate sample number				Average of replicates
	1	2	3	4	
Grams	Percent	Percent	Percent	Percent	Percent
12	14.4	13.6	14.1	-	14.0
5	18.4	18.0	18.4	18.1	18.2
2	18.4	18.8	19.2	18.9	18.8

1/ Fifty ml. of acetone was used. The shaking bottle had a capacity of 180 ml.

Two methods of oil extraction were studied: the shaking method and the soxhlet method. The equipment and procedure used in the soxhlet method were standard, except that powdered pumice was mixed with the liver material in the extraction thimble and raw, undried liver was used. All the extraction thimbles contained approximately the same weight of liver material (5.4 grams). Details of the shaking method were described in the earlier paper. The data are presented in Tables 1 to 4.

Table 2 - Data Obtained by Soxhlet Extracting Low-Oil-Content Liver with Acetone and Subsequently Purifying the Extractives with Acetone, Ethyl Ether, and Petroleum Ether

Step	Procedure	Apparent concentration of oil in liver						
		Replicate sample number						Average of replicates
		1	2	3	4	5	6	
		Percent	Percent	Percent	Percent	Percent	Percent	Percent
A	Soxhlet extraction for 16 hours with acetone	28.6	27.8	28.0	28.4	29.4	28.0	28.4
B[1]	Acetone purification of extractives from step A	21.1	20.3	19.4	19.4	21.0	20.9	20.4
C	Acetone purification of extractives from step B	20.9	20.1	19.3	19.2	20.5	20.5	20.1
D[2]	Ethyl ether purification of extractives from step C	19.2	19.0	18.9	19.0	19.1	19.2	19.1
E	Ethyl ether purification of extractives from step D	19.0	18.8	18.6	18.9	18.9	19.0	18.9
F[2]	Petroleum ether purification of extractives from step E	17.4	17.2	17.0	17.4	17.4	17.4	17.3
G	Petroleum ether purification of extractives from step F	17.3	17.1	17.0	17.4	17.2	17.3	17.2

1/ After the acetone used in the original soxhlet extraction had been evaporated from the extraction flask and the weight of extractives determined, the soluble portion of the extractives was redissolved in added acetone, and the resulting solution was freed of undissolved residue by passing the solution through a fritted glass filter funnel. The solvent was then evaporated and the weight of extractives determined. The purification steps that follow were carried out in the same manner, using the solvent designated in that particular step. The acetone-insoluble residue from step B was soluble in hot water.

2/ The residue was soluble in 95-percent ethanol.

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Table 3 - Data Obtained by Soxhlet Extracting Low-Oil-Content Liver with Ethyl Ether and Subsequently Purifying the Extractives with Ethyl Ether and Petroleum Ether

Step	Procedure	Apparent concentration of oil in sample						
		Replicate sample number						Average of replicates
		1	2	3	4	5	6	
		Percent	Percent	Percent	Percent	Percent	Percent	Percent
A	Soxhlet extraction for 16 hours with ethyl ether	18.4	18.0	18.3	18.0	19.0	18.4	18.4
B	Ethyl ether purification of extractives from step A	18.2	17.8	18.1	17.8	18.7	18.1	18.1
C	Ethyl ether purification of extractives from step B	18.1	17.8	18.0	17.8	18.6	18.0	18.0
D	Petroleum ether purification of extractives from step C	17.3	16.8	17.2	17.0	17.3	17.0	17.1
E	Petroleum ether purification of extractives from step D	17.2	16.8	17.1	17.0	17.3	16.6	17.0

It was found that:

1. In the extraction of low-oil-content liver by means of the shaking method and the use of acetone (without dispersing or drying agents), relatively more extractives were obtained from small-size samples than from those of large size (Table 1).

2. In the soxhlet extraction of low-oil-content liver for 16 hours with acetone, certain materials were extracted that were not readily soluble in acetone but were readily soluble in hot water (Table 2, footnote 1).

3. In soxhlet extracting of low-oil-content liver for 16 hours with acetone and then purifying the extractives with acetone, ethyl ether, and petroleum ether, certain of the extractives that were readily soluble in acetone did not dissolve in ethyl ether; and certain of the remaining extractives that were readily soluble in ethyl ether did not dissolve in petroleum ether. The acetone-soluble residues that were insoluble in ethyl ether dissolved in 95-percent alcohol, as did also the residues that were soluble in ethyl ether but insoluble in petroleum ether (Table 2, footnote 2).

Table 4 - Data Obtained by Soxhlet Extracting Low-Oil-Content Liver with Petroleum Ether and Subsequently Purifying the Extractives with Petroleum Ether

Step	Procedure	Apparent concentration of oil in liver						
		Replicate sample number						Average of replicates
		1	2	3	4	5	6	
	Experiment 1	Percent	Percent	Percent	Percent	Percent	Percent	Percent
A1/	Soxhlet extraction for 16 hours with petroleum ether	3.1	10.6	6.2	2.8	4.1	6.6	5.6
	Experiment 2							
A	Soxhlet extraction for 16 hours with petroleum ether	12.1	15.4	13.8	9.8	12.2	13.7	12.8
B	Petroleum ether purification of extractives from step A	11.9	15.2	13.7	9.5	12.1	13.1	12.6
C	Petroleum ether purification of extractives from step B	11.9	15.3	13.8	9.5	12.2	13.1	12.6

1/Pumice was not mixed with the liver material in the extraction thimble.

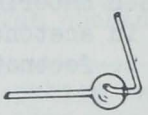
4. Using the soxhlet method, more ethyl ether or petroleum ether solubles were obtained when the initial soxhlet extraction was made with acetone than when it was made with ethyl ether or petroleum ether. Likewise, more petroleum-ether solubles were obtained when the initial extraction was made with ethyl ether than when it was made with petroleum ether (Tables 2, 3, and 4).

5. In the soxhlet extraction of low-oil-content liver, using petroleum ether as the solvent, the mixing of powdered pumice with the liver sample in the extraction thimble appeared to aid extraction (Table 4).

LITERATURE CITED

SANFORD, F. BRUCE AND KARRICK, NEVA L.
1950. STUDIES ON METHODS OF EXTRACTING VITAMIN A AND OIL FROM FISHERY PRODUCTS; PART III - EXPERIMENTS ON THE PETROLEUM ETHER EXTRACTION OF LOW-FAT LIVERS BY THE SHAKING METHOD. COMMERCIAL FISHERIES REVIEW, VOL. 12, NO. 6, JUNE 1950, PP. 4-9.

NOTE: THE OTHER PARTS OF THIS PAPER APPEARED AS FOLLOWS: PART I - "VITAMIN A POTENCIES OF OIL FROM GRAYFISH LIVERS OBTAINED BY EXTRACTION WITH PETROLEUM ETHER AND BY COOKING WITH WATER," BY D. MIYAUCHI AND F. B. SANFORD, COMMERCIAL FISHERIES REVIEW, SEPTEMBER 1947, VOL. 9, NO. 9, AND ALSO AS SEPARATE NO. 186; PART II - "EXPERIMENTS ON THE SOLVENT EXTRACTION OF LOW-FAT LIVERS, SAME REVIEW, FEBRUARY 1949, VOL. 11, NO. 2, AND ALSO AS SEPARATE NO. 224.



FREEZING AND CANNING KING CRAB

The techniques used in the preparation and handling of king crab are of primary importance in maintaining the quality of the canned or frozen product. King crab meat must be processed with utmost care to insure the maximum retention of color, flavor, and texture. A high quality product can be obtained only if careful attention is given to initial phases of handling the king crab, such as holding the live crab, butchering, cooking, cooling, removing the meat, and cleaning. Recommendations are based on observations of experimental and commercial packs.

Additional factors pertaining to packaging of meat for freezing and to heat processing are discussed in this publication.

By John A. Dassow

--Fishery Leaflet 374 (May 1950)