Determination of Fat Content in Fish with a Nontoxic, Noninflammable Solvent

SID KORN

National Marine Fisheries Service
Tiburon Fisheries Laboratory, Tiburon, Calif. 94920, USA

AND DAN MACEDO

University of California at Davis, Davis, Calif. 95616, USA

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An inexpensive method to determine the fat content in fish using a nontoxic, noninflammable solvent is described. A preweighed, dry, ground fish sample is put in a chromatography column with anhydrous sodium sulfate. One hundred milliliters of monofluorotrichloromethane (MF Freon, refrigerant-11) is poured through the column and the effluent collected in a preweighed beaker. After evaporation of the solvent on a hot plate and cooling in a desiccator, the fat is weighed and fat content calculated. Calculations for samples from two species were similar to those obtained by Association of Official Agricultural Chemists fat extractor method. The column method compares favorably with the fat extractor concerning cost and time.

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Les auteurs décrivent une méthode peu dispendieuse permettant de déterminer la teneur en gras du poisson à l'aide d'un solvant non toxique et ininflammable. Un échantillon de poisson, préalablement pesé, séché et moulu, est placé dans une colonne à chromatographie avec du Na_2SO_4 anhydre. On verse dans la colonne 100 ml de monofluorotrichlorométhane (MF Freon, réfrigérant-11), et on recueille l'effluent dans un becher préalablement pesé. Après évaporation du solvant sur une plaque chauffante et refroidissement dans un dessicateur, on pèse la graisse et on calcule la teneur en gras. Les auteurs comparent la méthode de la colonne avec celle de l'extracteur des graisses donnée par l'Association of Official Agricultural Chemists et arrivent à des résultats semblables. Sous le rapport à la fois du coût et du temps requis, la méthode de la colonne se compare favorablement avec celle de l'extracteur des graisses.

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THIS report describes an inexpensive column extraction procedure for determining fat content in fishes which utilizes a nontoxic and noninflammable solvent. Toxic, inflammable solvents such as ether, chloroform, and benzene are used in other methods: mainly by extraction by Soxhlet-type apparatus (Goldfisch Fat Extractor[1], Horowitz 1965) and shaking the ground sample with a solvent (Folch et al. 1951; Bligh and Dyer 1959).

Fish samples are dried at 70 C for 96 hr and reduced to a coarse granular consistency by repeated cutting with scissors or by electric blending. The dried samples and the 150-ml fat collection beakers are stored in a desiccator for use.

Chromatography columns (20 × 400 mm) with a size 2 teflon stopcock fused just below the fritted disc are prepared for extraction by inserting 20 g anhydrous sodium sulfate (Na_2SO_4) into the bottom of the column. A weighed dry fish sample mixed with 40 g Na_2SO_4 is poured into the column, followed by another 20 g of Na_2SO_4. One hundred milliliters of monofluorotrichloromethane (MF Freon, refrigerant-11) is poured into the column and the effluent collected with dry preweighed 150-ml beakers. Just after the effluent starts passing through the column, the valve is closed for a 1-hr retention period. This stops the flow and allows for a soak period. The extract is collected and the contents are concentrated on a hot plate (40–50 C) in a fume hood to near dryness (30–60 min). The beakers are then dried for 1 hr in a 70 C oven and cooled in a desiccator. After reweighing the beakers, the fat weight and the fat concentration are calculated.

To compare this method with an established procedure, dried fish were blended and divided into 47 2-g samples (striped bass *Morone saxatilis*) and 35 4-g samples (Pacific herring, *Clupea harengus pallasi*). Half of the samples (six per trial) were run on a Labconco–Goldfish fat extraction apparatus using the A.O.A.C. method (Horowitz 1965). The other half (five to six per trial) were run simultaneously using the described method.

[1]Reference to trade names in this paper does not imply endorsement of commercial products.

Two way analysis of variance of the data showed that the dried fish did not change in fat content over the test period ($P \leq 0.05$). This allowed us to combine values from different trials to compare results. Similar analysis also showed that results from the column method did not differ from the soxhlet procedure with 2- and 4-g samples ($P \leq 0.05$).

The percents fat obtained with the two methods were:

Method	Sample weight (*g*)	%Fat
Goldfisch fat extraction		
Striped bass (24)[a]	2.38±0.34[b]	18.2±0.34
Pacific herring (18)	4	7.84±0.20
Column fat extraction		
Striped bass (23)	2	18.1±0.64
Pacific herring (17)	4	7.87±0.17

[a]Number of fish.
[b]Mean and one standard error.

The column method compares favorably with other methods concerning labor and expense. It takes 3–4 hr from start to finish as compared with 6–7 hr for the Goldfisch apparatus and 24 hr for Folch's method. Cost for the column method is about $100 to set up equipment to run six samples simultaneously, and for the fat extractor about $990 plus the cost of extraction solvents. The column method also has applications in extracting fat from other samples, e.g. wet fish tissues, food stuffs, and mammalian tissue (Hesselberg and Johnson 1972).

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