Bear Grease

By L. F. Hoyt,
Research Dept., Larkin Co., Inc., Buffalo, N. Y.

BEAR grease or "oil" appears to have been an important, or at least a highly-prized, fat in the domestic economy of the American Indian as well as that of the American pioneer.

Horace Kephart in the 1906 edition of his "Book of Camping and Woodcraft," on page 296 eulogizes bear oil as follows: "Bear oil is better than lard for shortening and for frying. When mixed with sugar and spread on bread it is not a bad substitute for butter and syrup. . . . The Indians who were very fond of bear's grease used to preserve it so that it would not turn rancid even when they were traveling in summer by adding the inner bark of the slippery elm (1 drachm per pound of grease) keeping them heated together for a few minutes and then straining off. They also used sassafras bark and wild cinnamon for the same purpose. Bear oil is superior to olive oil for the table and can be used with impunity by people whose stomachs will not endure pork fat." According to Kephart, then, the Indians had practical experience in the use of inhibitors or antioxidants!

Bear grease is obviously neither an article of commerce nor of importance today, and probably has not been such since analytical chemistry has been a science. Techinal information concerning bear grease is decidedly meager.

Hooper (1) in 1908 reported the analysis of two samples of the fat of the Himalaya bear (Ursus torquatus, Wagner) and gives the following data:

	No. 1	No. 2
Specific gravity	.9013	.9007
Melting point	37.5° C	34.5°
Acid No.	13.8	33.2
Saponification No.	203.8	204.3
Iodin No.	52.8	62.8
Reichert-Meisl No.	0.93	0.86
Hehner No.	94.78	93.81
Melting point of fatty acids	42°	40°
Iodine number of fatty acids	57.3	63.0

Hooper states that the composition of the fat of the Himalayan bear greatly resembles that of lard.

Itagaki (2) in 1925 reported the characteristics of the fat obtained from the adipose tissue of the Japanese bear, (Ursus japonicus, Shinz) as follows:

Specific gravity	.9212
Melting point	22.5° C
Acid number	1.63
Saponification number	140-146.9
Iodine number	62.4

The Saponification Number reported by Itagaki appears to be incredibly low.

Incidentally both the Himalaya and Japanese bears are black bears not unlike the common black bear of North America.

Lewkowitsch "Oils, Fats and Waxes," 6 ed. 1922, vol. II, p. 872, cites references, and gives data on the characteristics of the fat of the polar bear. He also gives Hooper's analysis of the fat of the Himalayan bear, but there is no reference in Lewkowitsch to any data on the composition of the fat of the black bear of North America. In Uebelhode's comprehensive treatise "Chemie and Technologie der Ole and Fette" published in 1930 by S. Hirzel, Leipzig, there is no mention of bear fat.

The writer has had occasion to examine two authentic samples of bear grease derived from the black bear, Ursus Americanus.

The first of these samples was from a black bear killed in the Adirondacks in October, 1932, by Mr. Charles Larkin II. The sample was practically an oil of pale golden yellow color rather than a tallow or grease. On cooling to room temperature this sample would deposit a small portion of stearin. When first examined in November, 1933, the sample showed only a trace of rancidity by the Kreis test in spite of the fact that it had stood for over a year in a partly-filled tin can in contact with a small amount of water and albuminous matter.

The second sample was from a black bear killed in October, 1933, by Mr. H. H. Larkin, Jr., while hunting in the province of Quebec about ten miles south of Lake Desert. This sample was not an oil, but a grease of softer consistency than lard, nearly white and of waxy appearance. Some of it had in fact been used by the hunting party for cooking purposes when their supply of lard and bacon had begun to run low, and was reported to have been very palatable and satisfactory.

Both samples had been prepared in camp by completely rendering portions of the fatty tissue from the back and hind quarters of the animals. The characteristics of the two samples were determined after removal of extraneous moisture and filtering.

GREASE FROM THE BLACK BEAR (Ursus americanus)

	1. Adirondacks, 1932	2. Quebec, 1933
Source		
Melting point (capillary tube)	17.0° C	26.5° C
Refractive index nD, 20° C.	1.4695	1.4665*
Optical rotation 2 dcm., 20°C.	0.0° V	0.0° V*
Acid No., mgs KOH/gm.	3.65	1.40
Saponification number	195.6	196.6
Iodine number (Hanus)	90.1	63.2
Unsaponifiable (modified Kerr-Sorber method)	0.08%	0.10%
Hehner number	94.76	94.41
Saturated fatty acids	15.47%	30.24%
Unsaturated fatty acids	79.29%	64.17%
Titer	24.5° C	36.05° C
Iodine number of unsaturated fatty acids	98.8	82.8

*Determined on the clear, melted and supercooled sample, at 20° C.

The most striking thing about the analytical data of these two samples is the astonishing difference in their relative proportion of saturated and unsaturated fatty acids, and the corresponding difference in titer and iodine number. These differences would indicate that the diets of the two bears from which they were derived may have been quite different. W. H. Wright, author of "The Black Bear," published by C. Scribner's Sons, 1910, states that while this animal is omnivorous in its food habits such food items as small rodents, fish and miscellaneous insects form only an insignificant portion of its diet which is predominantly vegetarian. An examination of the stomach of the bear killed in Quebec Province had shown the contents to be almost entirely vegetable in origin. The fat of this bear closely resembles lard both in appearance and in composition whereas the fat from the Adirondacks bear was practically an oil, more nearly comparable in many of its characteristics to olive oil than to lard.

It is interesting to contrast bear grease with the extremely hard tallow produced on a vegetarian diet by the common white-tailed deer from the same northern region. The author has examined samples of venison

tallow which showed a titer of nearly 50° C. and an iodine number of less than 30.

It has been suggested to the author by Dr. C. A. Browne of the Bureau of Chemistry and Soils that the difference between these two samples of bear grease may be accounted for on the supposition that the softer grease may have been the product of a young animal while the grease of higher titer and lower iodine number may have been derived from an old bear.

Bibliography

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A Method for Determining Hardness of Fats

By C. O. GRAVENHORST, Assistant Technical Director, Aarhus Oliefabrik, Aarhus, Denmark

IT IS often of great importance to be able to state the hardness of a fat in concrete figures. Oil mills manufacturing hardened oils receive time and again requests for hardened oils or fats of harder or softer consistency without at the same time lowering or raising the melting point beyond certain limits.

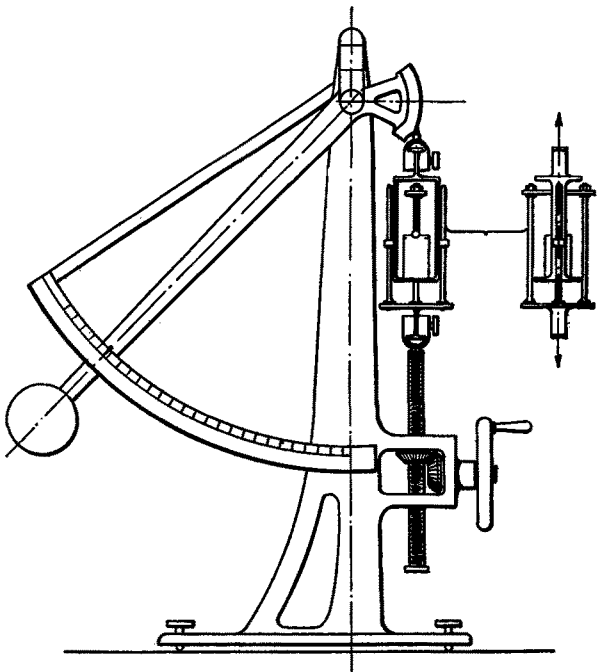
There is no difficulty in conducting the hardening process (the conversion of oleic acid molecules or fatty acid molecules with several double links into stearic acid molecules by introduction of two or more hydrogen atoms) in different ways so that the finished products may have the same iodine number and the same melting point but quite a different consistency (degree of hardness). In the manufacture of margarine a rather hard fat is usually preferred, one that is able to "carry" liquid oils and make a margarine resistant to hot weather. For certain other purposes, for instance, in the manufacture of biscuits, a plastic soft fat is preferable, a fat which stands a thorough working at a rather high temperature without melting.

The difference in the various products can largely be ascribed to the fact that in a soft hardened fat a certain amount of tristearine has been formed from tri-olein while in a harder material, principally monostearic di-oleoglycerides or distearic mono-oleoglycerides are formed, although the condition is really considerably more complicated, as, for instance, by the formation of iso-oleic acid.

For the determination of the varying degrees of hardness I constructed in 1927 a small instrument (see drawing No. 1) consisting of a metal tube having a metal rod, with a metal ball (a Brinnell Ball) of 10 mm. in diameter, attached at the lower end, inserted in such a way that the rod and ball could move freely up and down thru openings at the top and the bottom of the tube. The rod and the tube were connected by means of a metal spring, this spring being extended when pressure was exerted on the ball. On the rod an indicator was attached, passing thru a slit in the tube. Along the slit in the tube a scale was marked off by holding the tube and pressing the ball against the pan of a scale while placing different weights on the other scale pan. (For practical purposes two instruments were used with springs of different strength.)

The hardness of a fat was then determined by pressing the ball against the fat. As soon as the pressure becomes great enough the indicator remains stationary while the ball passes thru the fat. The point reached by the indicator on the marked scale was then read as the degree of hardness. When the samples are prepared in a definite way as is always necessary when carrying out physical tests, it is possible to obtain quite constant figures with this small instrument.

A few examples will illustrate the difference in hardness of fats which cannot be recognized by any other known physical or chemical test. In the examples given



Drawing No. 1

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Drawing No. 2