CHARACTERISTICS OF SELECTED FATS BEFORE AND AFTER EXTRACTION FROM FROZEN DESSERTS

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1950

Submitted to the faculty of the Graduate School of
the Oklahoma Agricultural and Mechanical College
in partial fulfillment of the requirements for
the degree of
MASTER OF SCIENCE
May, 1956

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ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to the Dairy Department of Oklahoma Agricultural and Mechanical College for the opportunity of conducting this study. He also wishes to express his appreciation to the following people: Dr. Morrison Loewenstein for his patience, advice and encouragement in the development of this study and the initial preparation of this paper; Dr. Charles L. Norton for his helpful suggestions in the preparation of this paper; Dr. James B. Mickle for his continued guidance and patience in the completion of this study and the final preparation of this paper; and Dr. Harold C. Olson for his encouragement and advice.

C.L.B.

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INTRODUCTION

The problem of detecting the adulteration of dairy products with substitute fats has been a popular subject for the past few years. Several states permit the use of edible fats, other than milk fats, in frozen desserts but these products must be labeled. Many manufacturers illegally produce products having a mixture of butterfat and non-milk fats (1) and label them as if they contained only butterfat.

Many workers have proposed methods for the detection of substitute fats in dairy products. However, most of these tests are based on data gathered for pure fats only, that is, vegetable or animal fats obtained from the manufacturer or milkfat which had been extracted from milk, cream or butter. Very few data have been recorded for fat which was extracted from frozen desserts.

It is not definitely known if fats have the same composition after being extracted from frozen desserts as they did before going into the product. Therefore, it is not known if the results of these methods which have been proposed to detect butterfat adulteration would be valid if applied to extracted fats.

Unpublished work at Oklahoma Agricultural and Mechanical College (19) compared butterfat extracted from ice cream by the Mojonnier ether extraction procedure to that obtained by modified Babcock methods. The results of this work indicated that the composition of butterfat varied depending on the method used to extract it from the ice cream. In connection with this work it seemed logical to determine if the process of

extraction caused any change in the composition of the recovered fat compared to that of the original.

The purpose of this study was to determine if the process of extracting fat from frozen dessert mix caused any changes in the characteristics of that fat. It was decided to use the Mojonnier ether extraction procedure for this experiment and to use fats which were representative of the types which are commonly used in frozen desserts.

LITERATURE REVIEW

Many tests have been developed for the detection of substitute fat adulteration of milk fat. Generally these tests are based on differences in the fatty acid composition of fats. Hilditch and Longnecker (11) and Bailey (4) reported that butterfat is distinguished from other fats by the low average molecular weight of its fatty acids. This is shown by its high saponification number and low refractive index. They also stated that butterfat contains larger amounts of steam-volatile fatty acids than do other types of fat. This is indicated by the high Reichert-Meissl number of butterfat.

Reichert-Meissl Number

Rutz et. al. (21) in their work with ice cream and butter collected in the state of Kansas, found a definite seasonal trend in the Reichert-Meissl number. They also indicated that unusual feeding conditions of cows may cause extreme variations in the Reichert-Meissl number.

Harper and Armstrong (8) mentioned that coconut or palm oil adulteration of butterfat is very difficult to detect by the Reichert-Meissl procedure. This was due to the relatively high content of low molecular weight fatty acids in coconut and palm oils.

Butyric Acid

Butyric acid is a four carbon, water-soluble fatty acid (3) which has a low melting point (-7.9°C.). According to Keeney (12), milk fat is the only fat which contains butyric acid. Coconut oil and palm oil

both contain low molecular weight fatty acids (caproic, caprylic, capric and lauric) but do not contain butyric acid. Keeney (12) declared that a test for the butyric acid content of fat may indicate the degree of milk fat adulteration. He proposed a chromatographic method of determining butyric acid in fats. The amount of butyric acid in butterfat was not constant according to Keeney's works (12, 14) because of seasonal variations, and the differences in individual cows.

Harper and Armstrong (8) reported a chromatographic method similar to that of Keeney's (12). In their experiment they mixed foreign fats with butterfat at the rate of 10, 20, 50 and 100 per cent. Using this method they were able to detect adulteration at all of these levels. They showed that the butyric acid content of the mixture is reduced in proportion to the per cent of foreign fat substitution. According to Harper and Armstrong (8), these findings were valid only when the type of substitute fat present and the butyric acid content of the original milk fat are known. They also contend that if coconut oil is used in the mixture it is difficult to detect its presence by this method.

Tocopherol

Bird and co-workers (5) stated that non-milk fat is high in alpha tocopherol, and that large amounts of alpha tocopherol in a fat would be a good indication that vegetable fat is present. They also stated that the per cent of alpha tocopherol in milk fat is low.

Bhalero and Kummerow (3) reported that the amount of tocopherol in fat is not a reliable indication of milk fat adulteration if less than 30 per cent "foreign" fat is present in the mixture. Keeney (12)

reported that animal fat, like butterfat, is low in tocopherol. Therefore a substitution of beef fat for milk fat would be difficult to detect.

Fluorescence

Various workers have used the fluorescence of fats as an indication of foreign fat adulteration. Lawrence (16) showed that under ultraviolet light butterfat fluoresced a bright yellow; coca fat an intense blue; cotton oil a faint tan; corn oil a blue-green; lard a violet; and peanut oil, a bluish-white color. Lawrence (16) concluded that a deviation from the normal yellow color of butterfat would indicate that it had been contaminated with a foreign fat. He also mentioned that casein gave a bluish-white color and may invalidate the results of this test.

Chilson and Sommer (7) also worked with the fluorescence of fats, but declared it to be unreliable. Bryant and Briggs (6) stated that Lawrence's fluorescence test is valid only when the butterfat has been completely replaced by foreign fats. They also stated that total substitution by foreign fats may be completely masked by the addition of small amounts of carotene.

Morris and co-workers (20) gave considerable attention to the ultraviolet absorption of fats and oils. Their work indicated that fluorescence was due to the presence of conjugated double bonds in fats and oils. This work established that milk fat contains about 0.001 to 0.0004 per cent of conjugated tetraencic systems, while margarine fats contain none of these systems.

Refractive Index

Many manufacturing companies are now producing molecular rearranged fats which, when blended together properly, resemble the fatty acid composition of butterfat (1). Bhalero and Kummerow (3) reported that a blend of two-thirds coconut oil and one-third hydrogenated cottonseed oil has iodine and saponification numbers which are the same as those of milk fat. However, it is impossible to duplicate the triglyceride structure of butterfat (3). Triglycerides have a specific melting point and refractive index and if subjected to rearrangement, the melting point as well as the refractive index will change. For instance, Bhalero and Kummerow (3) stated that when coconut oil is mixed with butterfat, it gives the same saponification and iodine numbers as pure butterfat, but a significant decrease in the refractive index of the alcohol soluble portion of the fat occurs.

Bhalero and Kummerow (3) further reported that a coconut and cottonseed oil mixture has a different solubility in alcohol than does butterfat. For instance, butterfat contained about 70 per cent alcohol soluble triglycerides at 20°C., while coconut oil was completely soluble in alcohol at 20°C. They stated that cottonseed oil and lard were less than 50 per cent soluble at 20°C. The refractive indices of the alcohol soluble and insoluble fractions of butterfat did not vary appreciably from that of the whole fat.

Fractional Crystallization

Henderson and Jack (10) did some work with fractional crystallization of milk fat. They dissolved milk fat in petroleum ether and precipitated it at -7°C., -13°C., -23°C., and -53°C. They determined

the iodine number, melting point, saponification number and Reichert-Meissl number on the precipitate at each of these temperatures and on the filtrate of the mixture held at -53°C. They reported that the greatest changes occurred in the iodine numbers and melting points. As the solidification temperature was lowered, the iodine number showed a continued increase while the melting point decreased.

Keeney's (13) report on presumptive crystallization indicated that when mixed with absolute ethanol, milk fat crystals have a tendency to float whereas non-milk fat crystals precipitated. He concluded that milk fat crystals were able to take up and hold air bubbles enabling them to float.

Henderson and Jack (10) pointed out that unsaturated fatty acids are not uniformly distributed among all the glycerides, since they are concentrated in greater quantities in the lower melting point fractions. They also stated that the proportion of unsaturated short chain fatty acids is not the same in all glycerides.

Krienke and Barrs (15) collected butter from agricultural experiment stations in the United States and solidified the fat from the butter at different temperatures. The results of this study showed a slight increase in the amount of volatile fatty acids of each fraction as the temperature of crystallization was lowered. They also concluded that there were no changes in the Reichert-Meissl number due to fractionation.

Extraction

Keeney (12) compared fat extracted by modified Babcock procedures to fat extracted by the Mojonnier ether extraction procedure in his

study of butterfat adulteration. He also used the Sager and Sanders detergent method for extraction. Keeney pointed out that fat extracted with the modified Babcock methods had a higher butyric acid content than the Mojonnier ether extracted fat. However, with the detergent method the butyric acid content was equal to that of the fat extracted by the Mojonnier procedure.

Literature Summary

A survey of the literature of the properties of fats and oils leads one to the conclusion that although many tests have been proposed to detect milk fat adulteration, there seem to be disadvantages to each. It would seem then that no single property can be used as the sole criterion for identifying all possible mixtures of edible fats. (1).

EXPERIMENTAL METHODS

General Procedures

The fats used in the work were:

Butterfat A — Sweet cream obtained from the Oklahoma A. & M. College Creamery in August, 1954.

Butterfat B — Sweet cream obtained from the Oklahoma A. & M. College Creamery in October, 1954.

Vegetable fat A — Mostly coconut oil hydrogenated to a melting point of 44°C.

Vegetable fat B — About 85 per cent coconut oil and 15 per cent cottonseed oil hydrogenated to a melting point of 40°C.

Animal fat — Beef fat hydrogenated to a melting point of 46°C.

These fat samples were divided into two lots. One lot was used as a control and the other was incorporated into the frozen dessert mix. These mixes were calculated to contain 12 per cent fat, 10 per cent milk solids not-fat, 0.03 per cent gelatin (225 bloom strength) and 0.05 per cent "Tween 60" (used as an emulsifier).

In August, two mixes were made using butterfat A and vegetable fat A as the fat sources. Two months later, three more mixes were made with butterfat B, vegetable fat B and animal fat as the fat sources. These five mixes were made and treated identically and the type of fat in them was assumed to be the only variable.

All of the mixes were pasteurized at 160° F. for 30 minutes in ten gallon cans partially immersed in water. They were then homogenized in a Manton-Gaulin homogenizer, under 2000 pounds of pressure per square

inch on the first stage and 500 pounds of pressure per square inch on the second stage. After this, the mixes were poured into plastic quart bags and placed inside regular quart ice cream cartons. The cartoned samples were then put in the hardening room at -20°F. ± 4°F. for 48 hours, after which they were transferred to a chest-type home freezer at 0°F. ± 2°F. The samples of mix were removed from this freezer as needed.

The fats were extracted from 500 grams of mix by a modified Mojonnier ether extraction procedure. The reagents used were as follows:

First Extraction	Second Extraction
500 ml. H_2O	750 ml. 95% alcohol
100 ml. NH_4OH	500 ml. ethyl ether
1500 ml. 95% alcohol	500 ml. petroleum ether
1000 ml. ethyl ether	
1000 ml. petroleum ether	

The samples were mixed thoroughly after the addition of each reagent.

The ether-fat solutions were combined and put into a filter flask and a partial vacuum was drawn by means of an aspirator. The flask was set on a hot plate and its contents heated, still under partial vacuum, at 135°F. for 10 minutes. Then it was placed in a cooling desiccator for 5 minutes. After this, the fats were stored in a refrigerator at 40°F. and used as needed.

The controls or originals for the butterfat samples were obtained by churning sweet cream. The churned fat was washed, melted, washed again, and resolidified. All controls for vegetable and animal fat samples were the original fats as received from the manufacturers.

Reichert-Meissl numbers, saponification numbers, iodine numbers (Hanus), melting points (Wiley) and refractive indices were run on

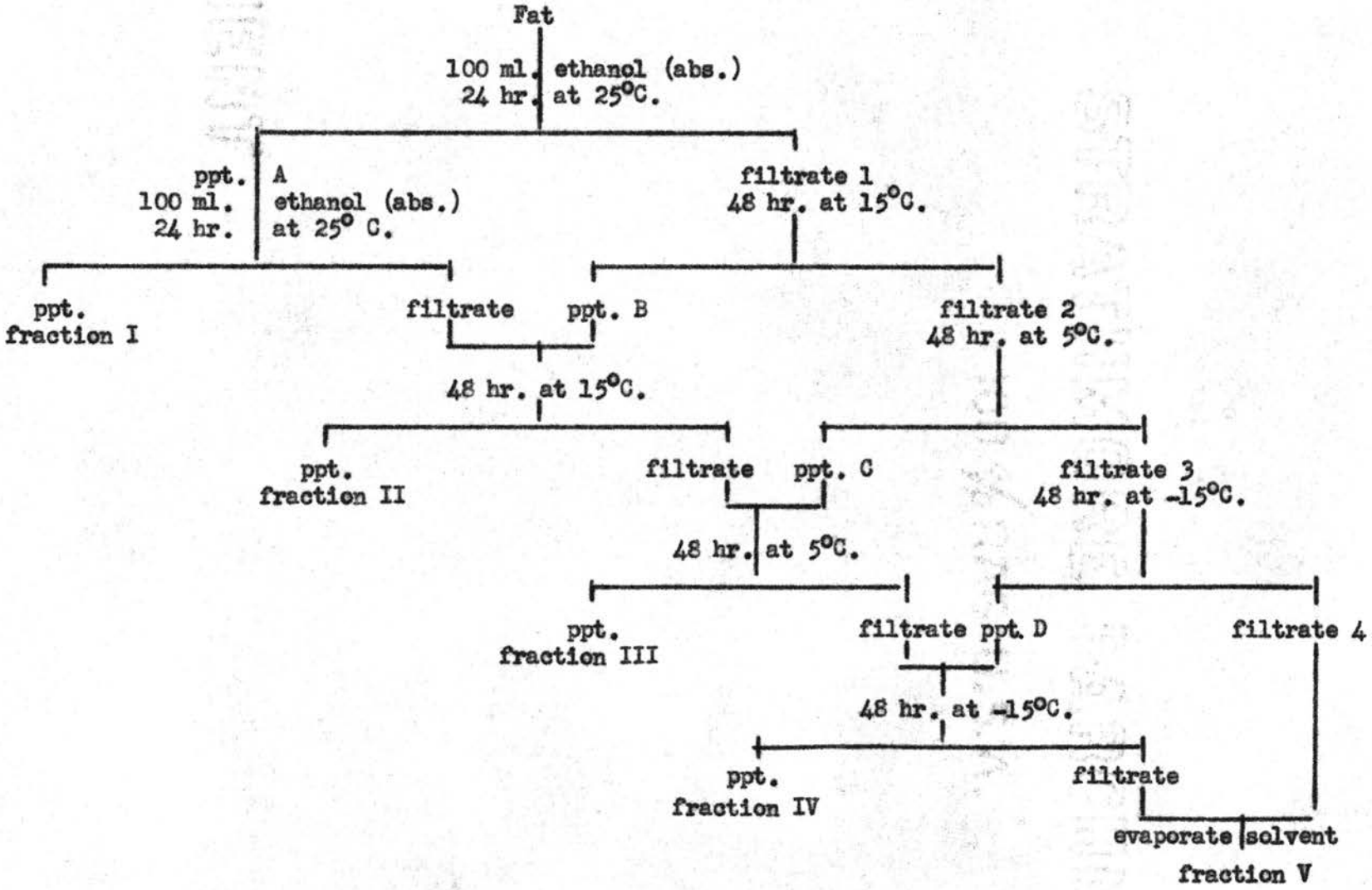
the extracted and control samples. These tests were conducted according to the directions given in the A.O.A.C. Methods of Analysis (2). Two different extractions were made on each sample of frozen dessert. Duplicate determinations were run on each extraction for the Reichert-Meissl number; three replicates were run for the saponification and iodine numbers and for the refractive index; while the values recorded for the melting point determination were the average of six replicates.

The moisture content was determined for each sample by a modification of the procedure given in the A.O.A.C. Methods of Analysis (2). Approximately two grams of fat were weighed in an aluminum dish, then heated at 100°C. for four hours, cooled, and reweighed. The difference between the original and the final weights was considered to be due to moisture loss. This was expressed in terms of percentage moisture present in the fats and used to recalculate some of the values obtained in this work. The values recorded for the Reichert-Meissl, saponification and iodine numbers were calculated on a moisture-free basis. The melting point and refractive index determination were reported without considering the percentage of moisture in the sample.

Fractionation

After the experiments had been started it was thought that a more accurate determination of the composition of the fats would be possible if the fats were separated into glyceride groups according to their melting points. This brought about the use of Loewenstein's (17) modification of the fractional crystallization procedure used by Henderson and Jack (10). A diagram of this procedure is shown in Figure 1.

Figure 1. Flow diagram of fractionation procedure



Samples of butterfat B, vegetable fat B and animal fat were fractionated by this procedure. Five ± 0.2 grams of fat were weighed in a 250 ml. flask and 100 ml. of absolute ethyl alcohol were added to it. The samples were heated until the fat was dissolved and the mixture was held at 25°C. ± 4°C. for 24 hours, then filtered to obtain precipitate A. The filtrate was then held at 15°C. ± 2°C. for 48 hours, and filtered to obtain precipitate B. Filtrate 2 was then held at 5°C. ± 2°C. for 48 hours and filtered to obtain precipitate C as shown in Figure 1. Filtrate 3 was then held at -15°C. ± 3°C. Precipitate D was filtered off and the filtrate 4 was used as a part of fraction 5. In all cases the samples were filtered at the same temperatures at which they had been incubated.

In purifying the fractions, it was necessary to use an extra 100 ml. of absolute ethyl alcohol and redissolve the precipitates which were then fractionated in the same manner as before. Precipitate A was dissolved in the absolute alcohol and held at 25°C. ± 4°C. for 48 hours, then filtered. This precipitate was labeled fraction I. The filtrate from fraction I was then added to precipitate B and held at 15°C. ± 2°C. for 48 hours and filtered. This precipitate was called fraction II and the filtrate was combined with precipitate C. This was held at 5°C. ± 2°C. for 48 hours, then filtered and the precipitate marked as fraction III. The filtrate of fraction III was added to precipitate D and held at -15°C. ± 3°C. for 48 hours, then filtered. The precipitate was used as fraction IV. The filtrate of fraction IV was added to filtrate 4 to make fraction V.

Experimental Error

An effort was made to calculate the errors involved in this experiment and the values obtained were used as a basis for determining if observed differences were due to errors in the procedure or to a change in the composition of the fat.

In calculating this error it was assumed that the errors of any one test were the same regardless of the sample used. The deviations were calculated from the individual means, then squared and totaled. The standard error was then calculated according to the procedure outlined by Love (18). This error was determined for the Reichert-Meissl, saponification and iodine numbers, and for the melting point determinations. The standard error was then applied to each individual fat sample and used in calculating the "t" test according to the procedure as outlined by Love (18).

Duplicate determinations of the refractive index were very close, always being equal to, or less than, the error involved in reading the refractometer scale ($\pm$ .0002). The standard error was not calculated for this determination. Instead, any value greater than $\pm$ 0.0002 was considered to be greater than the error of the method.

RESULTS AND DISCUSSION

The data obtained in this investigation are presented in the following tables. Moisture contents of the fat samples are shown in Table 1 and the results of analyzing the original and extracted fats appear in Tables 2 through 6. The values obtained for the two extractions of each mix were calculated separately and are recorded along with the values obtained for the original fats. Tables 8, 9 and 10 show the results of the fractionation procedure. Discussion accompanies each table.

Moisture Content

The data in Table 1 give the moisture percentage for the original and extracted fats used in this experiment. This was used in recalculating the values for the Reichert-Meissl, saponification and iodine numbers, as explained in the experimental procedure.

Table 1. Moisture content of original and extracted fats

Fats	Original Per Cent	Extraction Per Cent	
		1	2
Butterfat A	0.27	0.30	0.09
Butterfat B	0.27	0.70	0.20
Vegetable fat A	0.30	7.00	0.09
Vegetable fat B	0.00	0.50	0.17
Animal fat	0.00	0.00	0.20

Reichert-Meissl Number

The Reichert-Meissl numbers of the original and extracted fats are recorded in Table 2. There appeared to be no significant changes in the Reichert-Meissl numbers of the extracted fats compared to those of the original fats.

Table 2. Reichert-Meissl number of original and extracted fats

Fats	Original	Extraction	
		1	2
Butterfat A	27.2	26.4	26.9
Butterfat B	27.0	27.5	26.6
Vegetable fat A	0.1	0.4	0.4
Vegetable fat B	4.9	4.9	4.8
Animal fat	0.1	0.5	0.5

Saponification Number

The saponification numbers for the original and extracted fats are presented in Table 3. The first extraction of vegetable fat A and both extractions of vegetable fat B show significant differences between the extracted and original fats. The extracted samples are lower in all cases. The first extraction of butterfat A also showed a slight decrease in its saponification number as compared to the original. There were no significant changes in the saponification numbers of the other fats when extracted from frozen desserts.

For the most part, the changes which occurred in the saponification number of the extracted fats as compared to those of the originals were relatively small. The greatest change was the 3.0 which occurred in vegetable fat B, extraction 2.

Table 3. Saponification number of original and extracted fats

Fats	Original	Extraction	
		1	2
Butterfat A	224.1	223.2	224.2
Butterfat B	224.6	224.9	224.6
Vegetable fat A	191.2	189.5	190.0
Vegetable fat B	240.2	237.9	237.2
Animal fat	195.5	196.8	195.3

Iodine Number

The effects of extraction on the iodine number of fats are shown in Table 4. With the exception of three samples, there were highly significant changes in the iodine numbers of all the extracted fats as compared to those of the originals. The iodine numbers of the first extraction of butterfat B and vegetable fat B, together with the second extraction of vegetable fat A, showed no siginificant differences from

Table 4. Iodine number of original and extracted fats

Fats	Original	Extraction	
		1	2
Butterfat A	32.6	36.9	36.1
Butterfat B	35.8	36.4	31.5
Vegetable fat A	68.3	75.9	68.5
Vegetable fat B	10.5	10.0	4.0
Animal fat	44.2	46.1	40.3

those of the original. However, the second extraction of butterfat B and vegetable fat B showed a significant decrease in iodine values as did the second extraction of the animal fat. Both the extractions of

butterfat A, together with the first extractions of vegetable fat A and animal fat, indicated a highly significant increase in their iodine numbers compared to those of the original fats.

As indicated by the above discussion, the changes in iodine number of the extracted fats were not consistent; some samples increased after extraction while others decreased. In addition, most of the changes which occurred were relatively small even though they were mathematically significant.

Melting Point

As was the case with the iodine number determinations, changes in the melting points of the extracted samples compared to those of the originals were not consistent. Some melting points increased, some decreased, while others remained the same. The results of the melting point determinations are shown in Table 5.

Table 5. Melting point of original and extracted fats

Fats	Degrees Centigrade		
	Original	Extractions	
		1	2
Butterfat A	33.7°C.	37.0°C.	36.0°C.
Butterfat B	36.3	37.0	36.2
Vegetable fat A	42.2	41.9	40.5
Vegetable fat B	38.4	41.5	38.6
Animal fat	45.9	47.7	44.8

The first extraction of vegetable fat A together with the second extraction of butterfat B and vegetable fat B show no significant change in melting points when compared to the original fats. The second extractions of vegetable fat A and animal fat decreased compared to the

values obtained on the original samples. On the other hand, there was an increase in the melting points of both extractions of butterfat A and of the first extractions of butterfat B, vegetable fat B and animal fat.

Refractive Index

Table 6 shows the data for the refractive index of the extracted fats as compared to the original fats. The refractive indices of both vegetable fat extractions increased slightly compared to their original fats. Animal fat shows a decrease in its refractive index, as compared to its original fat. All other values were equal to, or less than, the error in the refractometer scale. Again the changes which occurred were not considered to be large.

Table 6. Refractive indices of original and extracted fats

Fats	Original	Extraction	
		1	2
Butterfat A	1.4548	1.4548	1.4548
Butterfat B	1.4548	1.4548	1.4550
Vegetable fat A	1.4580	1.4608	1.4608
Vegetable fat B	1.4512	1.4516	1.4518
Animal fat	1.4588	1.4578	1.4582

Combined Extractions

In order to summarize the results of this work, the values obtained for the two extractions of each fat were averaged and compared to those for the original fats. These results are shown in Table 7.

In the case of butterfat A, the iodine number and melting point of the extracted fat increased significantly compared to the values for

Table 7. Analyses of original fats compared with the average analyses of two fat extractions

Fats	Reichert-Meissl No.		Saponification No.		Iodine No.		Melting Point		Refractive Index	
	Orig.	Ext.	Orig.	Ext.	Orig.	Ext.	Orig.	Ext.	Orig.	Ext.
Butterfat A	27.2	26.7	224.1	223.7	32.6	36.5	33.7	36.5	1.4548	1.4548
Butterfat B	27.0	27.1	224.6	224.7	35.8	33.7	36.3	36.6	1.4548	1.4549
Vegetable fat A	0.1	0.4	191.2	189.9	68.3	72.2	42.2	41.2	1.4580	1.4608
Vegetable fat B	4.9	4.9	240.2	237.5	10.5	7.0	38.4	40.1	1.4512	1.4517
Animal fat	0.1	0.5	195.5	196.1	44.2	43.2	45.9	46.3	1.4588	1.4580

The original fats. Butterfat B showed a decrease in its iodine number as compared to the original while vegetable fat A showed a significant increase in its iodine number and refractive index. Vegetable fat B showed an increase in its refractive index and melting point compared to the original fat. It also showed a large decrease in its saponification and iodine numbers compared to those of the original fat. Animal fat decreased in its refractive index and iodine number while the melting point was larger than that of the original sample.

In all other cases the variations between the original and the extracted fats were equal to, or less than, the experimental errors involved between duplicate determinations on the same sample.

Fractionation

The results for the fractionation procedure are shown in Tables 8 through 10. Table 8 gives the data for the original fat; Table 9, the first extraction; and Table 10, the second extraction.

Table 8. Refractive indices of original fat fractions

Fractions	Temp.°C.	Butterfat B	Vegetable fat B	Animal fat
I	25°	1.4535	1.4528	1.4555
II	15°	1.4548	1.4519	1.4560
III	5°	1.4540	1.4515	1.4585
IV	-15°	1.4558	1.4509	1.4599
V	-15°	1.4570	1.4529	1.4653

The refractive indices of the fractions for butterfat and animal fat increased as the temperature decreased, with the exception of butterfat fraction III. The refractive indices of the vegetable fat fractions

decreased as the temperature was lowered. Vegetable fat fraction V however, did not show any change from vegetable fat fraction I. No explanation could be found for butterfat fraction III and vegetable fat fraction V not conforming to the general pattern set by the other fat fractions.

Table 9. Refractive indices of the fat fractions from extraction 1

Fractions	Temp.°C.	Butterfat B	Vegetable fat B	Animal fat
I	25°	1.4538	1.4590	1.4553
II	15°	1.4549	1.4583	1.4575
III	5°	1.4550	1.4514	1.4595
IV	-15°	1.4558	1.4507	1.4607
V	-15°	1.4569	1.4529	1.4640

The refractive indices for the fractions of butterfat and animal fat increased as the temperature of fractionation increased. This was the same pattern set by the fractions of the original fat (Table 8). Butterfat fraction III again did not follow the pattern set by the

Table 10. Refractive indices of fat fractions from extraction 2

Fractions	Temp.°C.	Butterfat B	Vegetable fat B	Animal fat
I	25°	1.4536	1.4529	1.4554
II	15°	1.4548	1.4519	1.4569
III	5°	1.4545	1.4514	1.4587
IV	-15°	1.4558	1.4508	1.4608
V	-15°	1.4569	1.4529	1.4652

other four butterfat fractions since its refractive index was lower than that of fraction I. The vegetable fat fractions also followed

the general pattern set by the original fats; as the temperature of fractionation was lowered, the refractive index decreased. Fraction V which did not show a decrease in its refractive index was the one exception.

In extraction 2, the refractive index of the butterfat and animal fat fractions again increased as the temperature of fractionation decreased. Vegetable fat fractions varied somewhat in their refractive indices in the second extraction. No explanation can be offered as to why the vegetable fat fractions I and II were so different from the other three vegetable fat fractions.

A general pattern was observed in this fractional crystallization procedure. As the temperature of fractionation was lowered, the refractive indices of the butterfat and animal fat fractions increased, while those of the vegetable fat fractions decreased. The refractive indices were somewhat higher for animal fat than for the butterfat fractions.

Since only a few trials were run, the results obtained from the fractionation procedure were inconclusive. However, on the basis of these limited data, it appears that this procedure offers promise as a method of identifying different types of fat in a frozen dessert. In this work the differences in the refractive indices of fat became greater as fractionation progressed. In one case for example (Table 8), the difference between the refractive indices of animal fat and butterfat was 0.0020 for fraction I and 0.0041 for fraction IV.

As was the case with most of the other methods of analysis, few differences were noted between the extracted and original fat samples.

SUMMARY AND CONCLUSIONS

The effects of an ether extraction procedure on selected fats extracted from frozen desserts were studied. Samples of two butterfats, two vegetable fats and an animal fat were used for this experiment. These fats were divided into two lots; one lot was used as an original and the other was made into frozen dessert mix. The fat was then extracted from the mix by a modified Mojonnier ether extraction procedure. A comparison of the extracted fat with the original fat was then made, using the Reichert-Meissl number, saponification number, iodine number, melting point and refractive index to analyze the samples.

The conclusions that were drawn from the results of this work are as follows:

1. Under the conditions of this experiment with the fat samples used, few significant differences were noted between the original fats and those same fats after being extracted from the frozen desserts by a modified Mojonnier procedure.

2. Observed differences, although statistically significant, were for the most part relatively small.

3. For practical purposes, there appeared to be little or no difference between the original fat and the same fat after being recovered from frozen dessert by this modified Mojonnier extraction procedure.

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