Estimation of lard in beef tallow by Gas Liquid Chromatography.

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Abstract

This investigation was carried out in an attemtp to a reliable method which can be used in a quality control laboratory for the detection and estimation of the lard contamination in beef tallow.

Fatty acid composition of lard; beef tallow and of beef tallow mixtures with 1; 3; 5; 7; 9; 11; 13; 15; 17; and 19% lard was determined by GLC. Tabulated results showed that the quantitative fatty acid composition markedly varied in lard than that in beef tallow. In general, it is clear from such data that lard contained more unsaturated fatty acids (60.447 %) than beef tallow (55.204 %).

The linoleic acid ($C_{18:2}$) component in lard and beef tallow is found to be 12.569 and 2.725%, respectively. While, the stearic acid ($C_{18:0}$) component was markedly lower in lard (11.960%) than that in beef tallow (16.190%).

An alternative check-up of the adulteration of beef tallow with lard is made from the $C_{18:0}/C_{18:2}$ ratio. This ratio was 0.952 and 5.941 in lard and beef tallow, respectively.

A calibration graph, is plotted by the percentage of lard in beef tallow against the percentage of linoleic acid component of afore-mentioned mixtures of lard in beef tallow. Estimation of lard in unknown samples, is assessed by determining the percentage of linoleic acid component and taking the corresponding percentage of lard from the graph. It is possible to determine the extent of admixture of lard in beef tallow by applying a simple regression equation.

Introduction

Usually imported canned meat; sausages; biscuits; and oils and fats are adulterated with pork or/and lard as well (Abdel-Fattah, 1970 and 1974; El-Dashlouty 1978; Abou-Arab 1980 and Bayoumy 1982). The consumption of pork and its by-products is prohibited in Egypt and other Islamic countries due to religious concepts.

Nowdays, great attention is paid to find out more definite and modern chemical methods for detection of lard in fat and oil products. Therefore, various specific chemical methods are assessed.

Somali et al. (1979) reported that an alternative index of adulterating of beef tallow by lard is made from the ratio of oleic acid to stearic acid. In pure beef tallow this ratio was 2.03, while in pure lard it was 3.28. If the adulteration in beef tallow by lard exists this ratio is more than 2.03. They pinted out that the linoleic acid component in beef tallow and lard is found to be 2.3% and 9.5%, respectively.

Materials and Methods

1- Materials:

Fat tissues:

All samples under study were taken from Oslo slaughter house immediately after slaughtering.

Lard was withdrawn from pork outer back fat of male yorkshire animals. While, beef tallow was trimmed free from lean meat of male animals.

2- Analytical methods:

2.1- Fat extraction:

Fat was extracted from fatty tissues using the method described by Folch et al. (1957) as modified by Ways et al. (1964) using chloroform: methanol (2:1).

2.2- Preparation of methyl esters:

The methyl esters of fatty acids were prepared using the method described by Rossell et al. (1983).

2.3- Gas liquid chromatography of methyl esters of fatty acids:

The methyl esters of fatty acids were separated using a PYE unicam (GCD) Gas Liquid chromatography apparatus with S 8 autosampler.

The quantitative determination of the different acids was performed by measuring the peak areas with an Hewlett pachard integrator 3390 A.

Results and Discussion

The GLC analysis of the methyl esters of fatty acids of lard and beef tallow are given in Table (1).

The data revealed that the quantitative fatty acid composition markedly varied in lard than that in beef tallow. In general, it is clear from such data that lard contained more unsaturated fatty acids (60.447%) than beef tallow (55.204%). Besides, the linoleic acid ($C_{18:2}$) component in lard and beef tallow is found to be 12.569% and 2.725%, respectively. While, the stearlic acid ($C_{18:0}$) component was lower in lard (11.960%) than that in beef tallow (16.190%).

An alternative check of the adulteration of beef tallow with lard is made from the $C_{18:0}/C_{18:2}$ ratio. This ratio was 0.952 and 5.941 in lard and beef tallow, respectively.

These results are in good agreement with those reported by Abd el-Fattah, (1970 and 1974); El-Dashlouty, (1978) and Farag et al. (1980).

A calibration graph, shown in Fig. (1) is plotted by the percentage of lard in beef tallow against the percentage of linoleic acid component of certain mixtures of lard in beef tallow. Estimation of lard in unknown samples, is made by determining the percentage of linoleic acid component and taking the corresponding percentage of lard from the graph.

The simple correlation coefficient (r) between percentage of lard in beef tallow and concentration of linoleic acid was highly correlated (r = 0.9942).

It is possible to determine the extent of admixture of lard to beef tallow by applying a simple regression equation

$$Y = A + BX$$

where:

Y = Percentage of lard.
A = Constant value (A = -26.1174).
B = Regression coefficient (B = 9.3827).
X = Concentration of linoleic acid.

Table (1) : Mean values of fatty acids composition of lard and beef tallow.

(% of the total).

Tallow	% of Fatty acid content												
	$C_{14:0}$	$C_{14:1}$	$C_{15:0}$	$C_{16:0}$	$C_{16:1}$	$C_{17:0}$	$C_{18Br.}$	$C_{18:0}$	$C_{18:1}$	$C_{18:2}$	$C_{18:3}$ + $C_{20:1}$	$C_{22:1}$	$C_{18:0}$ / $C_{18:2}$
Lard	1.545	0.075	0.145	23.257	4.033	0.515	0.930	11.960	38.95	12.569	3.675	1.145	0.952
Beef tallow	2.512	1.690	-	23.533	6.436	1.210	1.070	16;190	40.99	2.725	2.605	0.758	5.941

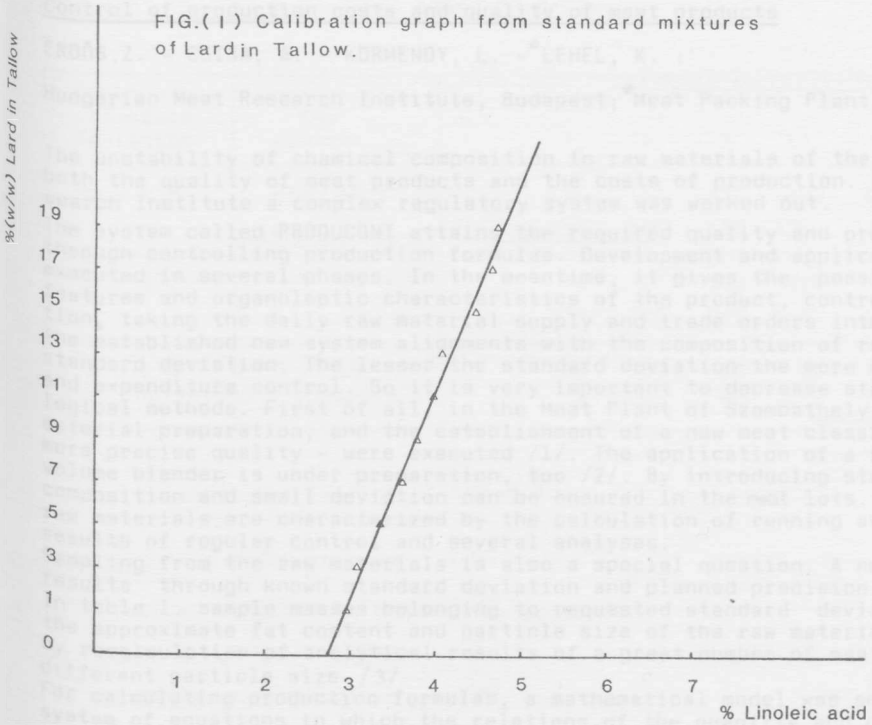

FIG.(1) Calibration graph from standard mixtures of Lard in Tallow.

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