# STUDIES ON SOME ANIMAL FATS

THESIS

Submitted in Partial Fulfillment of the

Requirements For the Degree of

MASTER OF SCIENCE

In

Food Science

By

Abd El-Moniem Hana Mehrez Nagaa

B.Sc. Agric. "Food Technology"

Cairo University

1966

For

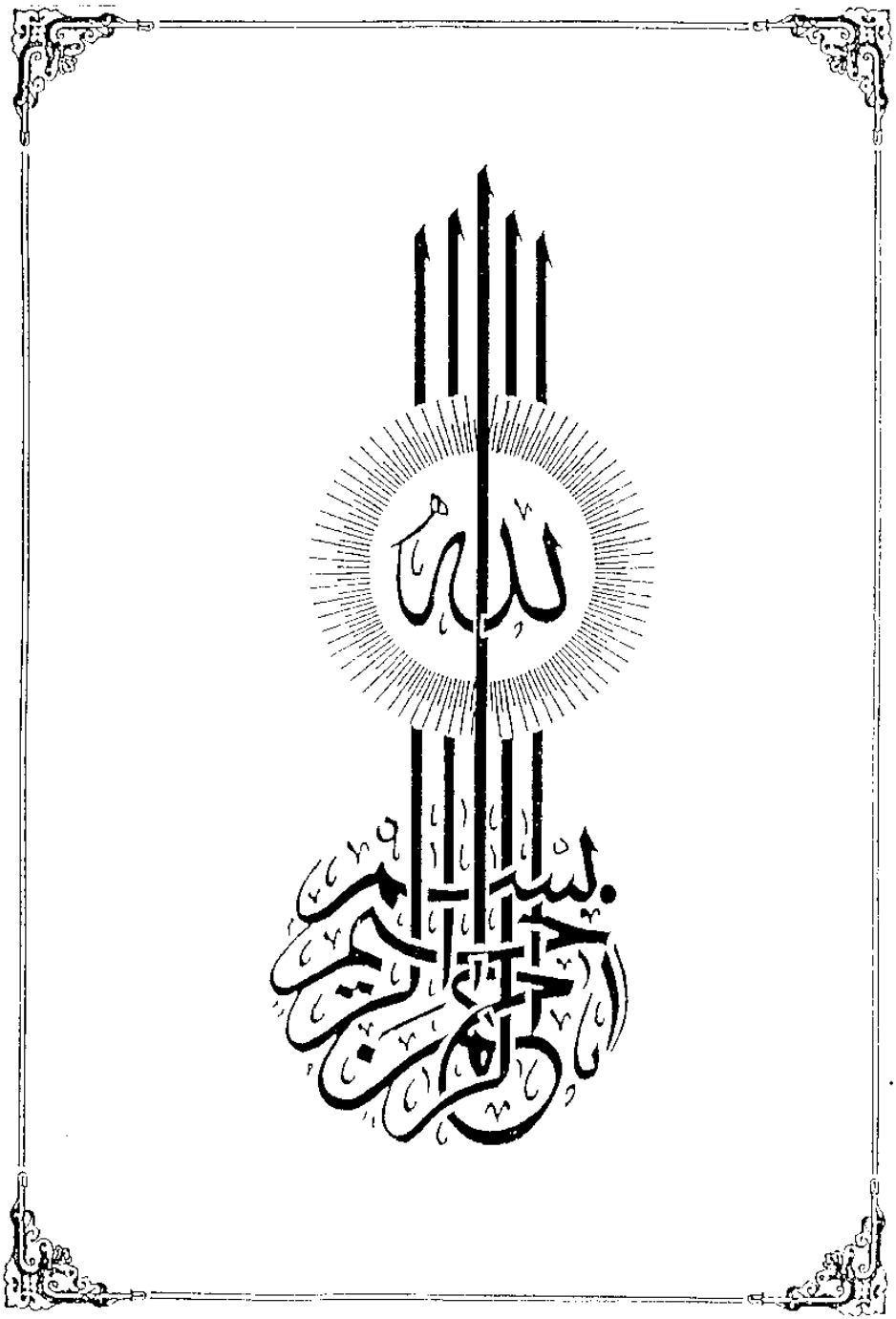
Department of Food Science

Faculty of Agriculture

Ain Shams University

1974

"THANKS TO GOD ALMIGHTY FOR HIS
(CONTINUOUS SUPPORT TO ME)



APPROVAL SHEET

This Thesis entitled "STUDIES ON SOME ANIMAL FATS"

for the M. Sc. Degree, has been approved by:

E. Wahl

F. G. El. Wakeil

Dr. M. R. Zawahry

Committee in charge

date: / /1974.

ACKNOWLEDGEMENTS

The author would like to express his thanks to professor Dr. M.F. Hussin of the Food Technology Department, Faculty of Agriculture, Ain-Shams University for his continuous supervision.

Much gratitudes are due to professor Dr. A.G. El-Warraky, who suggested the subject of this work, and for his supervision and help in presenting this thesis, stimulative discussion, valuable suggestions and constructive criticism.

I am highly indebted to professor Dr. M... El-Sawahry of the Pharmacology Department, Faculty of Medicine, Ain-Shams University for his sincere help during the steps of the biological part of this work.

My sincere gratitude and appreciation are extended to Dr. M... Abd Allah, lecturer of Food Science, Faculty of Agriculture, Ain-Shams University for the statistical analysis and the discussion of M. . . sheets as well as for his sincere contribution.

The author also wishes to thank the Egyptian General Organization for Food Industries for giving him full opportunity to accomplish this work.

C O N T E N T S

PAGE

PAGE

PAGE

# INTRODUCTION

Man has been familiar with fats since prehistoric times when he had no knowledge about the chemical nature of these substances. He only recognized differences in their properties and employed them in a variety of ways.

The use of fats as food stuffs was probably instinctive but fats also found a way for applications other than foods due to certain properties and behaviour of these substances under various environmental conditions. Knowledge of applications of fats and oils spread from ancient Egyptians and Phoenicians to Hebrews, and hence to the greek, Markley (1960).

A fat is, at ordinary temperatures; a mixture of liquid and solid esters of glycerol, and the glycerides of fats are not simple esters, where all three hydroxyl groups of glycerol have condensed with the same acid radical, but are rather mixed glycerides, in which different acid radicals are attached to the same glycerol molecule.

Land animals have harder fats than marine animals, and all warm-blooded animals have fats of higher melting points than those found in fishes, Sherman (1950).

Hilditch et al. (1940) have emphasized the general trend toward higher proportions of unsaturated, and then of more highly unsaturated fatty acids in the fats formed in the cooler regions by animals as well as by plants.

Evidence of the formation of body fat from food and food fat has been obtained by experiments upon the total amount and composition of the food eaten and were accurately known, Sherman (1950).

Fats obtained from various sources differ from one another in their physical and chemical properties because they contain varying amounts of different mixed esters. These esters may be solid, liquid, volatile, saturated or unsaturated compounds, Sherman (1950).

Therefore, each ester influences the physical and chemical properties of a fat in several measures according to the amount of that ester in the fat. These differences are the basis of tests for their identification.

The analysis of fats, is concerned, not as other foods and food products, with percentage composition but rather with the physical and chemical properties which serve as a basis for their identification and assay. Evaluation of the suitability of a given fat for a given purpose depends greatly on their physicochemical constants, Jacobs (1962).

In the course of animal fat processing, i.e. in their isolation through rendering and, refining, as well as during household cooking, animal fats are exposed to thermal treatments for varying temperatures and times. These treatments may affect the fats as far as the physical, chemical or biological properties are concerned.

The aim of this work is to investigate the effect of the thermal treatment of fat on the physical, chemical properties and biological values of mutton fat and cow depot fat. The following points were investigated:

a- Physical and chemical changes that occur in untreated mutton and cow depot fats, as well as those of thermally treated fats.

b- The growth rates of albino rats fed on each of thermally treated and untreated fats.

c- The blood serum cholesterol of the rats during on forementioned animal fats.

d- The effect of fat diet content on food consumption of albino rats for thermally treated and untreated fats.

e- The effect of fat diet content on feed efficiency of albino rats for thermally treated and untereated fats.

## REVIEW OF LITERATURE

### I. Physical and chemical properties:

a) Specific Gravity:

Winton and Winton, (1949) found that the specific gravity of mutton tail fat at 100/15.5°C ranged from 0.858 to 0.860, and for beef tallow the range was 0.860, 0.863.

b) Refractive Index:

Winton and Winton,(1949) noticed that the refractive indices of mutton tail fat and beef tallow were 1.4506 and 1.4506 - 1.4508 respectively.

c) Melting Point:

Winton and Winton, (1949) declared that the melting point of mutton tail fat was 44 - 49°C, while for beef tallow, it was 42 - 49°C.

Ryoichi et al. (1947) reported that the open capillary melting point has been adopted as characteristic value of fats in some standards of testing materials. In these standards, some disagreements were found concerning the practical procedures of

measurement and the sort of materials applicable. The authors studied the procedure and its applicability from the stand point of reproducibility of the measurement. The materials used were animal fats, hydrogenated animal, and vegetable fats. The repeatability was determined from five replicated measurements with five capillaries and expressed as standard deviation . Reproducibility depended primarily upon the complexity of the chemical nature of the samples. The open capillary melting point was found to be applicable to rather limited sorts of materials when the reproducibility of the measurement must be $\pm$ 1°C.

Walisch and Eberle, (1957) found that when the sample contained in a capillary tube, was heated up by a full transistorized temperature controller, the speed of temperature increase was 0.50°C per min. The temperature measured by a microthermocouple immersed in the sample was recorded. The temp./time curve showed a distinct region of constant temperature, identical with the melting point or boiling point, respectively. From the course of the conversion region the purity of the sample can be