STUDIES ON LOW CALORIE BUTTER

By

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THESIS

Submitted in Partial Fulfilment of the Requirements for the Degree of Ph. D. (Dairy Science)

Food Science Department
Faculty of Agriculture
Ain-Shams University

1985

APPROVAL SHEET

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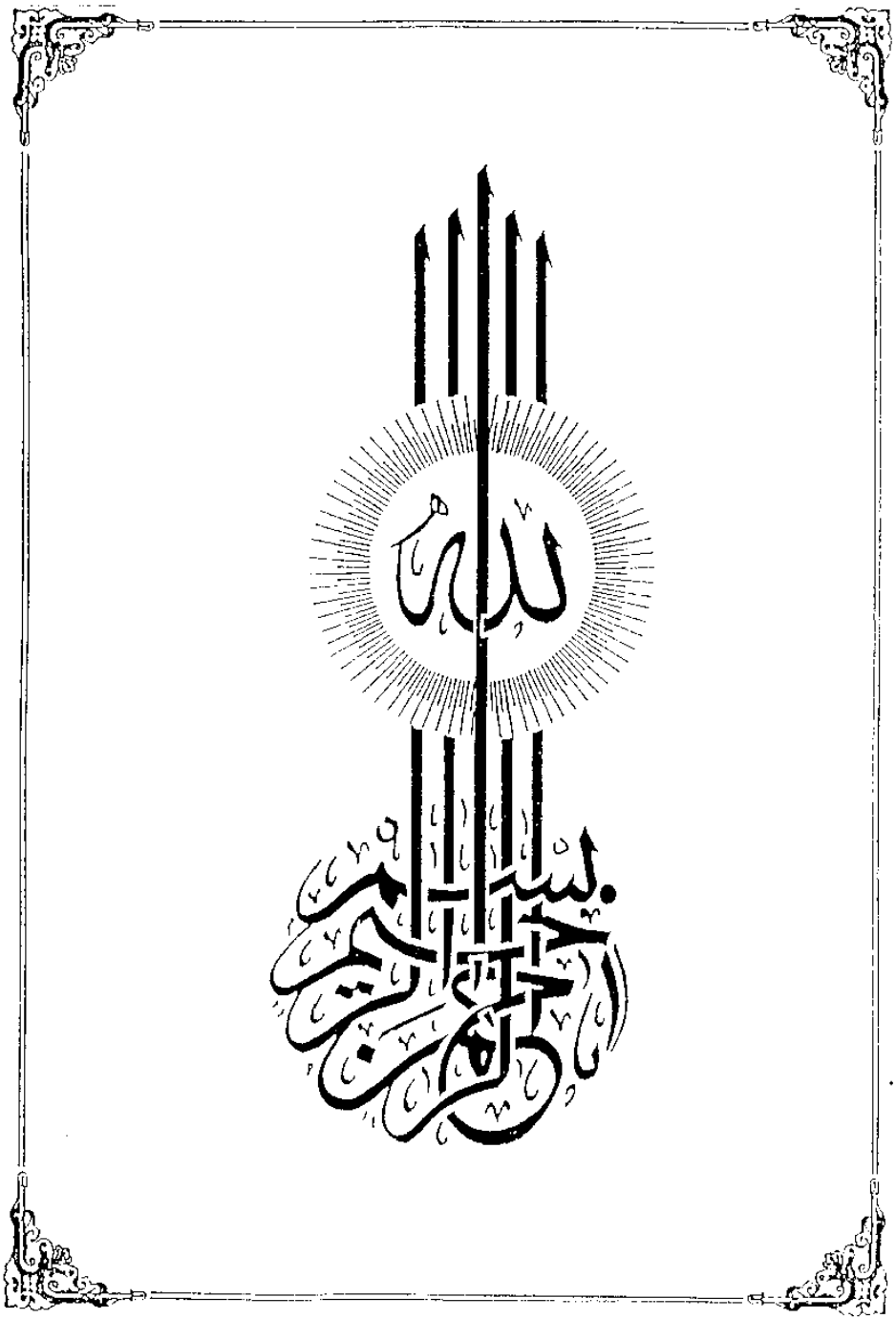
Date : 23/ /1985.



ACKNOWLEDGEMENT

With all the appreciation, many thanks to both Prof. Dr. A.A. Hofi, the Former Head of the Food Science, Faculty of Agriculture, Ain Shams University, and to Prof. Dr. M.A. El-Ghandour, in the same Department for suggesting this study, supervising and encouragement during the course of study and preparing the manuscript of this work.

Grateful acknowlegement is extended to Prof. Dr. Hayam El-Gazzar, Head of Dairy Chemistry Research Section, Animal Production Research Institute, who supervised this work, gave every possible guidance, advice and constructing criticism during the execution of this research.

Extended thanks to Assist. Prof. Dr. H.F. Haggag, Department of Food Science, Ain Shams University for his valuable scientific directions during writing.

Award of thanks must be passed to all those who without their help, this research would not have been possible, the staff members of Food Sci. Dept., Fac. of Agric., Ain Shams Univ., and the staff members of Dairy Research Dept., Animal Production Institute (A.R.C.), Ministry of Agriculture.

CONTENTS

CONTENTS : Cont'd.

INTRODUCTION

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Butter obtained by creaming the milk and churning the cream is the traditional milk product in which milk fat has been concentrated to high degree, i.e. 80 %.

Considerable developments have been taking place in the use of butterfat in recent years, some representing appreciable depatures from the general concept of butter, such as low-butter-fat spreads. These products variously known as half-butter, half-fat-butter, low calorie butter, ... etc., are characterised by a greatly reduced fat content which may be as low as half that of normal butter.

The product contains 45 to 50 percent butter fat and 5 to 6 percent of milk solids-not-fat. It's caloric value is 41 percent lower than butter and it has a storage life of 10 days at 10°C. The reasons for its popularity are attributed to flavour, low caloric content, good spreadability, favourable price, and attractive packaging.

This work was carried out to investigate the possibilities of manufacturing a cheap and palatable

low calorie butter of high nutritional value from conventional butter or high fat cream mixed with different levels of skimmilk powder, acid cheese curd or whey proteins either salted or unsalted.

The study comprises two main parts as follows:

PART I : Low calorie butter made from conventional butter mixed with some additives.

PART II : Low calorie butter made from high fat cream mixed with some additives.

REVIEW OF LITERATURE

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Many investigations had been done on the effect of using skimmilk powder, cheese curd and whey proteins in the manufacture of low calorie butter. They studied the physical, chemical and organoleptic properties of the resultant butter.

Doiby (1970) studied the properties of recombined butter made from fractionated fats by emulsifying it with skimmilk to 40 % fat and churned. A high melting point fraction improved standing up quality at high temperature.

Sozzi (1971) obtained low calorie butter by pasteurizing cream containing 35 % fat at 72°C for 30 sec., and then centrifuged to a 60 % fat content. The concentrated cream was heated rapidly, (e.g. in a tubular or plate heat exchanger) to 90°C, and a mixture of skimmilk and sufficient acid culture of Streptococcus diacetilactis was added to bring the pH 5.2-5.6 and the proportion of fat to 48-52 %. The product has the consistency and taste of butter but is low in calories, containing 49-51 % milk fat, 2 % protein and 47-49 % water.

Bahr et al. (1972), developed a method for the manufacture of low calorie butter. In this method, cream with 43-45 % fat is ripened with 1.5 % pure butter starter to pH 5.3-5.8, which takes normally about 14 hr. The cream at a temperature of 14-16°C, depending on the season, is then churned in an ordinary continuous machine to give butter with 60 % fat, 4 % SNF and 36 % moisture.

Forman and Matouskova (1973), made a low calorie butter which contains about 56 % butterfat, 4 % SNF and 40 % moisture, its calorie value is about 30 % lower than that of normal butter. It is made from partially ripened pasteurized cream, which allow the required high moisture content to be obtained directly, or with adjustement by addition of less than or equal to 4 % water. The butter does not contain preservatives or emulsifiers and possess all the characteristics of normal butter, above all pronounced aroma and taste.

Forman et al. (1974), described two methods for the manufacture of high moisture butter (up to 50 %), i.e., (I) which involves working the additional water into ripened-cream butter with fine moisture

dispersion and (II) where the moisture content is increased in the churning cylinder of the continuous buttermaking machine by a modification of the churning process. The butters have good organoleptic properties and keeping quality. Both methods were considered feasible for commercial production of low calorie butter with 35-50 % moisture.

In 1974, Lagoni produced a low-calorie milk-based butter substitute by separating milk into low-fat and high-fat fractions at 30-70°C, dehydrating the low-fat fraction at 35-78°C and recombining the two fractions to form a mixture having a fat content of less than or equal to 40 % which may be achieved by adding non-fat milk-based dry substances such as dried milk, curd cheese, casein or products of casein and whey protein. Spreading capacity was improved by homogenization or by ultrasonic treatment.

Moor et al. (1974), made low-calorie butters (oil in water emulsion). In these experiments, the best were obtained with the addition of a mixture of equal amounts of CMC (carboxy methyl cellulose) and gelatin. The products with 40 % butter fat,

49-50 % moisture and 10 % milk SNF retained their original flavour for 4 weeks at refrigerator temperature.

Poznanski et al. (1974) produced low-calorie dietetic butter with lowered fat content. Cream of $< 8^{\circ}$ sH plasma acidity and 30-35 % fat is pasteurized at 92-95°C, aged at low temperature to crystallize fat, warmed to churning temperature, filled into a churn to 25 % capacity and dairy dye (not specified) was added at 1-4 ml for each kg. fat. Churning was carried out to produce 2-4 mm granules, butter milk was removed from the churn and the granules are formed into a lump, moisture content showed be 12-14 %. A calculated quantity of 17 % solution of "sodium proteinate" was added to produce a final content of 40 $\pm$ 1 % fat, 10 $\pm$ 1 % SNF and 50 $\pm$ 2 % moisture, then 2-4 % cultured pasteurized whey was added. The mixture is emulsified by running the churn at rapid rate with a stream of water at 35-40°C on its outer surface. Complete emulsification should be achieved under these conditions in 20-30 min. The butter was packaged in PVC (polyvinyl chloride), cooled for 2-3 hr and stored at 4°C.

Rek (1974), stabilized a low calorie spread consists of a water in oil type emulsion of 70-40 % of a protein containing aqueous phase (containing preferably 0.7-3.6 % milk protein) and 30-60 % of fat phase containing 0.3-1.5 % of a hydrophobic metal oxide (Si, Al, Mg or Fe oxides may be used). The emulsion stability is significantly improved.

Vyshemirskii et al. (1974) brought out krestyanskoe butter with increased serum content and consequently contains more protein, minerals, lactose, ... etc., than ordinary butter. This type of butter made by batch or continuous processes from sweet or ripened cream, the butterfat content is about 72.5 % for unsalted butter and 71 % for salted butter and the maximum moisture content is 25 %. This butter can be made from high-fat cream which has 20-21 % moisture initially and is fat standardized with buttermilk and cream. Standardization had no significant effect. The experimental butter was generally at least as good as the sweet cream control butter with 16 % moisture.

Ellervee et al. (1975), described a method for obtaining butter of reduced fat content and increased