STUDEIS ON THE USE OF EDIBLE FATS IN ICE CREAM MANUFACTURE

BY

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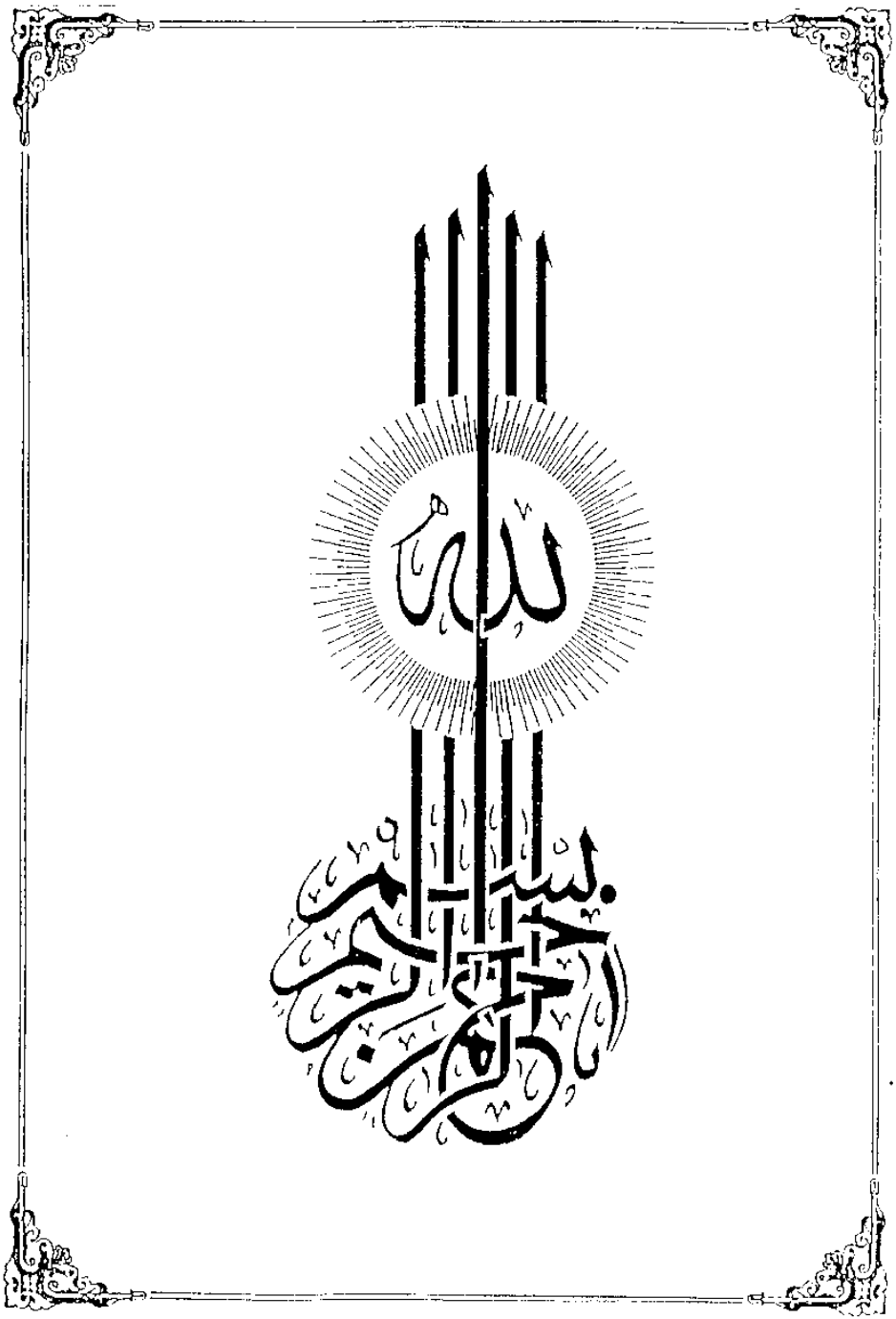

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INTRODUCTION

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Milk fat is an expensive constitutent of the ice cream mix. From both nutritional and economical views, it might be recomended to substite milk fat by vegetable oils. The primary risk factor asociated cardivascular disease is the high consumption of animal fats and/or cholesterol (Saarivirta 1974). Vegetable oils have no effect no a therogenic index and therefore can be used to replace animal fat in diet (Gogman et al 1958). Vegetable oils used in many parts of the world include cotton-seed oil, coconut oil, palm oil, soyabean oil, and sunflower seed oil. Vegetable oils and fats manufacture is now a major industry.

The use of vegetable oils lowers the plasma cholesterol concentrations. In general dietary cholesterol is reduced, when less sarurated fats are eaten but vegetable sources of saturated fats e.g. coconut oil, among foods of animal origin rich in cholesterol but not is saturated fat. Vegetable fat containing polyunsaturated oils are useful in cholesterol lowering diets (Saarivirta 1974).

Replacment of milk fat with vegetable oils in making ice cream mixes had been studied by several investigators. Plam oil had been used in making ice cream in UK (Berger,1975) and soft ice cream in USSR (Kozin and Rebrin, 1974).

Also, Yossef et al. (1981) in Egypt manufactured a high quality ice cream by substitution of fresh cream fat by cotton seed and corn oils.

The aim of this investigation was to prepare ice cream mix using skimmilk powder and vegetable oils in order to make a more economice ice cream of good nutritional value with accepted organoleptic qualities. This might meet with reduced costs and relevant medical slogans.

Therefore, this work is presented in the following parts :-

Part 1 : Effect of substitution percent of milk fat by edible oils on some properties of plain ice cream.

Part 2 : Effect of different edible oils on some properties of plain and flavored ice cream.

Part 3 : Statistical and Economical view.

REVIEW OF LITERATURE

Rivew of Litereture

Inoki et al. (1971) used a milk fat or refined edible fat (melting point 32-37° C) mixed with 2 kinds of emulsifiers, milk solid not fat or sodium casienate, and texturizer such as polysaccharide, followed by homogenization and spray-drying. The reconstituted final product can be whipped with 80% overrun at 20° C and frozen in a freezing cabinet of a domestic refrigerator. The frozen dessert has a desirable texture and hight stability of shape at room temprature.

Kozin and Rebrin(1974) prepared 7 variants of soft ice cream with vegetable fat of general % composion : fat > 15, sugar < 18 and dry mater 42, using 20% synthetic cream. The cream was prepared by homogenization at 4-50 atm of 12.37% fat base (hydrogenated vegetable fat or sunflower seed or coconut oil, or margarine (melting point 33 °C). 3.0 % Sodium citrate, 19.35 % whole liquid milk, 0.5% gelatin and 9.5% liquid milk were incorporated into the cream. The mix was filtrated, pastearized, honogenized, coold, ripened, frozen and sale or storge. He found that overrun averaged 39.7 - 50.6 % , bulk density 0.682 - 0.806 gm/cm^3, and viscosity 17.4 - 27.8 p. Also mentioned that 3 of the variants 100 % hydrogenated vegetable fat base) or particularly recomended for whol sale production, distribution and also considered suitable for hardened ice cream.

Berger (1975) discussed some applications of palm oil in the ice cream manufacture and bakery industry.

Carlile and chidely, (1976) used fat composition in ice cream manufacture comprises a corandomised blend of palm fat " Iodine value < 50 " with > 20% of softening fat consisting e.g. entirely of louric fat palm kernel oil, coconut oil or babassu oil their fractions and/or hydrogenated fats drived from them " or contaning additional fats, particulary whole palm oil, iodine value is 30 - 50 and slip melting 37-45 °C. The composition was used at 10% by weight in the manufacture of vanilla ice cream containing 11% dried skim milk, 14.5 % sucrose, 2% corn syrup and locust bean gum stabilizer and emulsifire.

Fedeli (1976) discussed the suitability of butter fat as a source of fat in many foods particulary ice cream, depends on its gradual melting over a wide range of temperature and absence of high-melting glycerides, characteristics which contribute to smoothness of tast and absence of grittiness it has to be related by other fats. These should conform as possible to butter fat in these respects.

Finney & Jenkison(1976)made a mixture of (hydrogenated coconut oil, sucrose, spray-dried milk, gelatine, toffe flavour, black treacle, and water (18%) which injected into a soft core on the mould of stick machine and the confection allowed to harden in the mould and then stored at - 20 °C.

El-Hami et al. (1977) substituted butter fat in ice cream mixes partly by margarine. They indecated that the P^H value of mix, overrun and flavour of ice cream were decresed by increasing the percentage of margarine. They masked the defect of flavour by adding chocolate or cinnamon.

They reported that the addition of margarine had no harmful effect on the body and texture of the resultant ice cream. They finely concluded that it is possible to substitue butter fat by margarine up to 50% in chocolate ice cream mixes.

Davenat (1978) made the ready for use preparation up of 2-15% butter fat, e.g. from milk, and/or other fats which may be hydrogenated, animal or vegetable oils in ice cream mixes with 6-14% dried skim milk extract, 7-20% sucrose, 0-17% glucose dextrose or invert sugar < 1% and perferably only 0.15 0.5% a non gelling stabilizer such as carrageenats with locust bean flour and fruit pectin, and 20 - 35% (based on the wight of stabilizer) of gel-rtarding salt such as dipotassium phosphate.

El-safty et al (1978) mentioned that addition of hydrogenated oil contaning 80% vegetable oil and 20% tallow (m.p.37 $^{\circ}$C) gave a tallowy flavour when used to replace 20% of butter fat in ice cream. But when 100% vegetable oil (m.p. $^{\circ}$C) was used, up to 50 substitution could be made, especially when the ice cream was flavoured with chocolate or cinnamon.
Wight pergallon and specific gravity were not markedly affected, but overrun and melting ratio decreased as the degree of the substitution with hydrogenated oil increased.

Finney (1978) patent a stabilizer system for 9.5% liquied oil blend ice cream comprising microcystalline collulose in combination with >1 carboxymethylcellose and galactomanan gums. Ice craem prepared by conventional processing method from a mix contaning 27% of 32.5% total solid skimmilk, 13% sucrose, 2% glucose syrup, 9.5% liquid oil

blend, 0.45% monoglyceride, emulsifire, stabilizeres (0.15% locustbean gum, 0.2% " A vicel " and 0.15% sodium carboxymethylcellose) 0.3% glycerol + coluor and flavour was an excellent product resembling conventional ice cream, but spoonable at - 20 °C.

Roperts et al. (1978) used 9.5% dried skim milk, 15% sucrose, 9.5% palm oil, etc. to madeice cream and extruded through a perforated plate with many noles with cross-sectional areas in the range of 5-80 British standard mesh. Preferaby, the holes are so closely spaced that the product coalesces to some extent. Air passages may form in the product with the advantage that it can be more readily broken and more easily eaten direct from the deep-freezer than conventional products.

Rowchett (1978) prepare ice cream or dessert base with 3-22 parts by weightwater, 2.7 - 3.9 parts dried milk and 3.2-3.9 parts by weight animal fat and 2.7 - 3.9 parts vegetable oil which heated to the boiling boint and blended together. While sterring 0.8 - 1.2 parts by weight egg yolk were added giving a homogeneous mixture which is cooled rapidly to 0.5 °C, and 0.1 - 0.4 parts of a fat emulsifier were added. Desserts or ice creams prepared with this base will keep their lightness and will not become compacted on keeping.

Dea and pillai (1979) discussed a process for preparing an ice cream confection compriss shear-freezing. a mix contaning disperes edible fat and suger and/or sugar alcohols and/or other low molecular wt. (less than or equal 600) materials in amounts molary equivalent to disaccharide conce. of greater than 32%, aerting the mix to an overrun of greater

than or equal 140% and hardening the extruder ice cream at 20 Degree or below. An ice cream made from a mix with 9.42% spray dried milk, 1.11% dried whey and 7.45 butter had an overrun of 170% good stability, and although firm-hardened, its softness was such that it possessed the organoleptic qualities of soft serve ice cream with good mouthfeel, flavour and texture characteristics, when consumed directly after removal from the deep freezer.

Hasman (1979) servied on the production of and results with peanut butter. Flavoured ice cream was carried out at 8 manufactures in the U.S.A of the various flavours being combined with peanut butter, chocolate appears to be the most popular another combination is vanilla ice cream with a peanut butter variegate. Also reported that most companies who have obtained commerical success.

Luquet (1979) compared the specifications for ice cream amonge France, Belgiem, Italy and the U.S.A, and tabulated the acutal composition of commerical ices bsed on milk, vegetable fats, or eggs and of sorbets.

Dea and pillai (1980) invented stabilizer system for 9.5% oil blend ice cream comprising a galactomannan gum (locust bean gum) and kappacarrageenan in a wight ratio of 1:1 to 10:1 (preferably 3:1 to 7:1) at preferable 0.15 - 0. 8% by wight a mix may by prepared by mixing 27% concentrated skim milk (32.5% T.S), 13% sucrose, 2% glucose syrup, (9.5 % oil blend, 0.45% monoglyceride emulsifier, 3% glecerol (freezing point depressant), 0.25% of the above stabilizer system, colour, flavour, and salt, plus water to 100%. The ice cream made from this mix is claimed to be scoopable at-20 $^{\circ}$C.

Also, he described a hardened stabilized ice cream confection comprising an aerated composition of crystats, edible fat particles and an aqueous syurpy phase which has been shear - frozen under aeration, extruded at a nozzle temp. of approx-8 degree C to - 13 degree C and hardend at approx. - 20 degree C.

Yossef et al. (1981) substituted the milk fat in ice cream mizes (which contaned 14% fat, 10% milk SNF, 15% sugar and 0.5% gelatin) partially by anhydrous butter oil, cotton seed oil or maize oil. Glycerol monostearate was used as a emulsifire. They tested the mixes and resulting ice cream for viscosity and specific gravity and ice cream also for overrun. They found that organoleptic scores of ice creams were best with substitution of 50% butter oil (without emulsifier) and up to 25% cottonseed oil or maize oil (with emulsifier).

Basiron (1982), studied the U.K. market for palm oil and provided tabulated data on the estimated average intake of visible edible oils and fats in the UK. in 1960, 1970 and 1980 (kg/head/yr), the estimated UK usage of refined palm oil in food products in 1976 - 1981 (margarine, compound cooking fats, others including retial cooking oil/fats, cattering frieng media, industrial fring media, confectionery fats, ice cream, non dairy products.) palm oil used in main food uses and % share of edible oils and fats.

Bray (1982) made a detailed comparison of the nutrative value of 6 formulation for ice cream with 4 or 8% fat, using butter or hydrogenated coconut oil as the fat source, together with dried skim milk and (in 2 formulations) whole