

PALM-BASED REDUCED FAT SPREAD

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by: NOOR LIDA HABI MAT DIAN, MOHD SURIA AFFANDI
YUSOFF AND MOHD NOOR MAMAT

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INTRODUCTION

Under the influence of official dietary recommendations, product pricing structure and evolving consumer life styles, the market for spreading products is undergoing radical changes. The general trend now is towards reduced fat consumption. Reduced fat spreads fulfill such a demand.

In addition, reduced fat spreads can be formulated to meet the demands of convenience (*i.e.* spreadability at refrigeration temperature) and health (by using polyunsaturated or *trans* fatty acid-free fats).

Reduced fat spreads normally contain 41% to 60% fat and are used chiefly for spreading on bread. In reduced fat spreads, the oil, although a small constituent in the emulsion, still exerts a major influence. The oil phase must have a structure, which is determined by the size, shape and arrangement of the fat crystals. This network of crystals determines the melting characteristics of the products and provides the form and texture of the finished spread. The amount of these crystals, measured as solid fat content, is important especially at the following temperatures:

- 10°C – this indicates spreadability at refrigerator temperature;



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Palm Oil Research Institute of Malaysia, Ministry of Primary Industries, Malaysia
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-8259155, 8259775, Telex: MA31609, Telefax: 03-8259446



- 22°C – this determines stability, the resistance to oiling-off at room temperature; and
- 30°C and 35°C - a factor in the sensory melt properties of the spread.

FORMULATION

Approximate compositions for reduced fat spread with fat contents in the range of 40 -60% are given in *Table 1*. The pH of each formulation may be adjusted, according to taste, solubility of any protein present, and required microbiological shelf life, within the range 4.8-6.2. Process conditions will vary according to the formulation.

Table 1. Basic Formulations for Reduced Fat Spread

Composition (%)	Product Type	
	60%	40%
Fat	59.5	39.5
Emulsifier (s)	0.5	0.7
Water (+ salt) (adjust to pH 4.8 -6.2 with lactic acid if required)	39.0	51.7
Stabiliser	1.0	8.0
Potassium Sorbate	-	0.1

FAT MIXTURE

Reduced fat spread is regarded as being equal in quality to a cold-spreadable margarine and should, therefore, be spreadable direct from the refrigerator. For this reason cold-spreadable fat blends are used. It should be remembered that the harder the fat blend, the more easily the reduced fat spread separates into fat and water on spreading after 2 -3 days refrigerated storage.

STABILIZERS (WATER PHASE)

Stabilizers are especially important in reduced fat spreads. They help to promote water in oil emulsion by inhibiting coalescence of aqueous phase droplets during product processing and in-use situations. It is done by balancing the viscosity of the two phases which make up the spread, namely water and fat. A selection may be drawn from gelatin, gums, starch or seaweed extracts.

EMULSIFIERS

Emulsifiers are generally of the fat soluble type and primarily help to reduce the size of the aqueous phase droplets dispersed in the fat continuous phase. Mostly they function by creating stabilizing films at the water/oil interface and by altering other characteristics such as the wettability by water of the fat crystals. Monoglycerides are in common use for spreads of all types.

PRODUCTION

The fat and water phases are heated separately to 35°C-40°C. When the entire fat phase is ready the agitator and the circulation pump are started. The water phase is then added slowly to the fat phase. It is necessary to ensure that the emulsion remains a water-in-oil emulsion throughout the process. The emulsion type can be determined by dropping a few droplets of the emulsion into cold water whilst stirring -a water-in-oil emulsion will remain in whole drops whereas an oil-in-water emulsion will be dispersed evenly in the water. If an oil-in-water emulsion results, then the water phase may have been introduced too quickly, the emulsification intensity may have been insufficient or the quantity of emulsifier used may have been inadequate. The stability of the emulsion may be determined by pouring some of the emulsion into a measuring glass and then observing the time it takes to separate.

The emulsion should be cooled and kneaded through a tube chiller and packed under more or less the same conditions as cold-spreadable margarine.

USAGE OF PALM OIL AND ITS DERIVATIVES IN REDUCED FAT SPREAD

Palm oil tends to crystallize as β' crystals and thus is an attractive option when blending ingredients for reduced fat spreads. It also contains a substantial proportion of higher melting triglycerides (with relatively low solids content at 10°C) and this combination is particularly favourable for formulating reduced fat spreads for semi-tropical climates. By contrast palm oil should be blended with other fats in temperate regions as the solids/temperature characteristics do not result in products which melt quickly on the palette, (*i.e.* too high solids at 35°C) and relatively slow crystallization properties can result in rather brittle structure. For this reason, blends containing up to 30% palm oil is recommended. Alternatively palm oil may be interesterified with fat which contain shorter chain fatty acids such as palm kernel oil to give blends with cooler, quicker melting characteristics. Palm olein may also be used extensively.

Advantages of using palm oil and its derivatives may be summarized as follows:

- Plastic consistency widely applicable in reduced fats spreads.
- Crystallization in the most amenable β' polymorphic form.
- Fractions can be used to replace hydrogenated fats, and give a wide plastic range of uses especially in tropical climates.
- Contains *cis* linoleic acid.
- Contains natural colouring useful in reduced fat spreads.
- Has good heat stability.
- Low content of short chain fatty acids minimises risk off-flavour development.

ECONOMIC FEASIBILITY

Undertaking palm-based reduced fat spread production is potentially a profitable commercial venture. The currently weak command of the broad domestic reduced fat spread market is expected to increase rapidly with increased affluence of the society, associated with the prevailing rapid economic growth of the country. Concern of the population for healthy living is expected to become increasingly fashionable. This concern is usually associated with reduced fat diet, thereby supporting the reduced fat spread market.

For an assumed reduced fat spread annual production of 3,000 tonne, an internal rate of return (IRR) of 42 and 22% may be generated, depending on whether the 40 or 60% fat spread variety is produced. The expected generation of IRR is well in excess of the opportunity cost of capital, assumed to be 10 percent rate of interest. Repayment of capital outlay may be obtained in three or five years in the 40 and 60% reduced fat spread output respectively. A much superior profitability measure may be obtained if land and factory building are rented. In both instances, the proposed project is able to withstand a 10% increase in costs and still earn a respectable level of profits.

FUTURE DEVELOPMENTS

As consumers switch from 82% fat products, alternative spreads with good qualities and reliable functional properties but with reduced fat content can offer benefits of convenience, health, improved taste and, from the manufacturer's point of view, lower raw material costs.

Palm oil and its derivatives should make significant contributions to these developments especially from the standpoints of economy, nutrition and improved product texture. In particular their fatty acid compositions and trace ingredients can offer positive nutritional benefits, and specialized fractions can provide valid alternatives to chemically hardened fats.

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For more information kindly contact:

Director-General
PORIM
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.