



FOOD TECHNOLOGY FACT SHEET

Adding Value to OKLAHOMA

405-744-6071 • www.fapc.biz • fapc@okstate.edu

December 2017

Margarines and Spreads

Nurhan Dunford

FAPC Oil/Oilseed Chemist

The Oklahoma Cooperative Extension Service Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; home economics; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of Cooperative Extension are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and based on factual information.

- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

The first margarine formulation was patented in 1869 by a French chemist. It was developed to meet the butter shortage caused by urban population increase during the Industrial Revolution and the need for table spreads with better keeping quality than butter for the armed forces. Earlier products were prepared with tallow and lard. Liquid oils such as cottonseed and peanut oils were added to reduce the melting point of the blends. Later margarine formulations were made with coconut and palm-kernel oil. Although hydrogenated oils were available around 1910s, their use in margarine production was not extensive until 1930s. Technological advancements had a great impact on the expansion of margarine production and availability. The first continuous-closed production system was available around 1940s.

Legislation also played a significant role in the broad use of margarines. With the pressure from dairy farmers, producer licensing fees and taxes were levied on margarines starting in 1886. Some states even prohibited the sales of colored margarines. By 1941 margarine was recognized as food and gained "Federal Standard of Identity," which defined the product and allowed vitamin fortification. Following World War II, taxes on margarine were dropped due to increasing butter prices and growing interest in oilseed, specifically cottonseed and soybean, farming.

The current Code of Federal Regulations, Title 21, Volume 2 (CITE: 21CFR166.110) describes the requirements for the Specific Standardized Margarine as follows: Margarine (or oleomargarine) is the food in plastic form or liquid emulsion, containing not less than 80 percent fat, which needs to be determined by the

method prescribed in "Official Methods of Analysis of the Association of Official Analytical Chemists," 13th Ed. (1980), section 16.206, "Indirect Method," under the heading "Fat (47)." Just like any other food, margarine will contain only safe and suitable ingredients approved for food production.

Margarine may consist of several ingredients. 1) Edible fats and/or oils, or mixtures of these, whose origin is vegetable or rendered animal carcass fats, or any form of oil from a marine species that has been affirmed as GRAS (Generally Recognized as Safe) or listed as a food additive for this use, any or all of which may have been subjected to an accepted process of physico-chemical modification. Margarine may contain small amounts of other lipids and lipid soluble compounds, such as phosphatides and/or unsaponifiable constituents [portion of oils and fats other than the glycerides (see fact sheet FAPC-196) such as steroids or vitamin A] naturally present in the fat or oil. 2) One or more of the following aqueous phase ingredients: i) Water and/or milk and/or milk products. ii) Suitable edible protein including, but not limited to, the liquid, condensed or dry form of whey, whey modified by the reduction of lactose and/or minerals, non-lactose containing whey components, albumin, casein, caseinate, vegetable proteins or soy protein isolate, in amounts not greater than reasonably required to accomplish the desired effect. Aqueous ingredients used in margarine production shall be pasteurized and then may be subjected to fermentation prior to mixing with the oil/fat phase. The final product is a solidified or liquid emulsion. According to the U.S. Food and Drug Administration rules, final product, margarine, must

contain minimum 15,000 international units of vitamin A per pound. Other ingredients may include:

- Vitamin D (minimum 1,500 international units-IU of vitamin D per pound. 1 IU is the biological equivalent of 25 nano gram cholecalciferol/ergocalciferol).
- Salt, sodium chloride (potassium chloride may be used for dietary margarine or oleomargarine).
- Sweeteners.
- Emulsifiers.
- Preservatives including, but not limited to, the following within these maximum amounts in percent by weight of the finished food: Sorbic acid, benzoic acid and their sodium, potassium and calcium salts, individually, 0.1 percent, or in combination, 0.2 percent, expressed as the acids; calcium disodium EDTA, 0.0075 percent; propyl, octyl, and dodecyl gallates, BHT, BHA, ascorbyl palmitate, ascorbyl stearate, all individually or in combination, 0.02 percent; stearyl citrate, 0.15 percent; isopropyl citrate mixture, 0.02 percent.
- Color additives (pro-vitamin A (beta-carotene) is considered a color additive).
- Flavoring compounds.
- Acidulants.
- Alkalizers.

Labeling of margarine

Oleomargarine or margarine must conform to the definition and standard of identity for oleomargarine or margarine (see the previous section). The identity standard for oleomargarine or margarine applies to both the uncolored and the colored products.

The label of the package will have the word “oleomargarine” or “margarine” in type or lettering at least as large as any other type or lettering on the label (the height of each letter, the area occupied by each letter as measured by a closely fitting rectangle drawn around it, and the boldness of letters or breadth of the lines forming the letters). The label also will display a full and accurate statement of the ingredients contained in the product.

The word “oleomargarine” or “margarine” should appear on each panel of the package label that might reasonably be selected by the grocer for display purposes at the point of sale.

Each part of the contents of the package will be contained in a wrapper which bears the word “oleomargarine” or “margarine” in type or lettering not smaller than 20-point type.

The wrappers on the individual products contained within a retail package shall contain the information previously described. However, the name and place of business of the manufacturer, packer or distributor do not have to be labeled when (1) the individual products are securely enclosed within and are not intended to be separated from the retail package under conditions of retail sale; (2) the wrappers on the individual products are labeled with the statement “This Unit Not Labeled For Retail Sale” in type size not less than one-sixteenth inch in height. The word “Individual” may be used in lieu of or immediately preceding the word “Retail” (LDL) in the statement.

The FDA labeling rule requires every ingredient used in the food shall be declared on the label. The term “milk” means milk from cows. If any milk other than cow's milk is used in whole or in part, the animal source shall be identified in conjunction with the word milk in the ingredient statement. The term “Margarine” also could be described as a product which has a consistency similar to butter and contain edible oils or fats other than milk fat if made in imitation or semblance of butter.

Types of Margarines

Just like butter, margarine is a water-in-oil emulsion, a mixture of two immiscible phases involving a continuous liquid fat phase surrounded by water droplets as the dispersed phase held together as a homogenous phase by compounds known as emulsifiers.

A number of different types of margarines are produced: soft, whipped, liquid and spreadable stick margarines. As the name implies, soft margarines are soft, contain about 50 percent less solid content than regular margarines and spreadable at refrigeration temperatures. Soft margarines are made with higher percentages of liquid oils containing as high as 70 percent polyunsaturated fatty acids. These margarines cannot be formed into firm sticks, hence, packaged in tubs made of plastic or coated paperboard.

Whipped products are produced by whipping or incorporating nitrogen into margarine. The product has 50 percent more volume to the pound, softer and easier to spread at refrigeration temperatures. Due to the lower density of the whipped products, the consumption of equivalent volume servings of whipped product provides one-third fewer calories than regular margarine.

Liquid margarines are packaged in a squeeze bottle and is pourable at refrigerator temperatures. This product provides convenience to both home consumers and

commercial users. It is easy to use for pan frying and spreading on cooked foods or foods to be frozen. For commercial users, it is packaged in drums and can be easily metered and pumped. Some products are stable for long periods of time at room temperature as well as at refrigerator temperatures.

The most important functional characteristics of margarines are spreadability, oil separation and melting temperature. Oil separation also referred to as oil-off occurs when the type and size of the fat crystals are not sufficient to hold the liquid oil in the matrix. This could be an important issue for stick type margarines, because, liquid oil could leak out of the inner wrappers and even out of the outer package causing problems with the prints on the packages and other product handling, storage and shipping issues. Soft margarines are packaged in tubs. Hence, oil-off is not a big problem during handling because the tub contains the product. However, consumer perception of the product might be marginalized.

A high quality margarine melts quickly at body temperature with a cooling effect in the mouth, does not leave a greasy or waxy feel on the palate and delivers a quick flavor perception.

Spreads

The products with less than 80 percent fat content cannot be labeled as margarine because they do not meet the Federal Standards for margarine. The term spreads or table spreads refers to a broad range of products categorized based on the fat content as high-fat (70 to 82 percent), medium-fat (48 to 60 percent), low-fat (35 to 42 percent) and very low-fat (less than 30 percent) spreads. In general, the low and very low-fat spreads are designed for applications similar to “spreading on a slice of bread,” while the high-fat spreads are used for cooking and frying applications.

Diet spreads targeting those consumers who are on low fat diets may have only one-half the fat of regular margarine. Early spread formulations did not contain milk proteins because of their adverse effects on emulsion formation and stability. Because of the large amount of water presence in diet spreads, larger amount of emulsifiers and more intensive mixing are required in churning the emulsion than the regular margarines. Diet margarines are manufactured only in soft form. The disadvantages of diet spread include poor melting and flavor release profiles and emulsion breakdown in the mouth. Because of their high-water content, they are not preferred for frying or baking applications and may

have shorter shelf life, i.e. about four months compared to 6 to 12 months for regular margarines.

“Balanced Spreads” are usually formulated for improving cholesterol balance, i.e. lower low density lipoprotein (LDL) and higher high density lipoprotein (HDL) and HDL/LDL ratio. They also may be trans fats free (see fact sheet FAPC-133, 134 and 164) and provide optimum balance of polyunsaturated, monounsaturated and saturated fatty acids and omega-6 to omega-3 (see fact sheet FAPC-135) and butter like flavor.

The current consumer trends in margarines and spreads favor products with better health profile such as high polyunsaturated fatty acid content, low energy content, products made with “natural” ingredients such as unhydrogenated oils, natural flavors and no preservatives. New and advanced production technologies such as interesterification and enzymatic processes and developments in the production of commodity oilseeds with favorable fatty acid profile are helping the food industry formulate products that are affordable and meet the shifting consumer demands.