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Value Added Edible Food Products Developed Using Palm Oil and Its Fractions

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Summary

Oil palm is a perennial crop, which produces high oil yield compared to other vegetable oils. Oil palm fruit yields two types of oil, crude palm oil (CPO) and palm kernel oil (PKO). Palm oil contains an equal amount of unsaturated and saturated fatty acids; this property is unique among all vegetable oils and fats. This balance of saturated and unsaturated fats contributes to palm oil's stability, versatility, and its ability to give products a longer shelf life. Oil palm is valuable not just for its high oil output, but also for the byproducts it produces. Due to its low cost about 80% of palm oil find its way into food products. Palm oil can be used in cooking and in producing many food products like shortening, margarine, Transe-free vanaspati, cheese and yogurt, and bakery products etc.

1. Introduction

Oil palm (*Elaeis guineensis* Jacq.) is the highest oil yielding perennial crop, outperforming other vegetable oil crops, which yields approximately 5 tons of oil per hectare in a year. This crop is commercially grown in many countries in the world *viz.*, Africa, Malaysia, Indonesia, South America, and India. India is one of the major consumers of edible oil in the world and the major portion of edible oil is being imported from other countries. Oil palm cultivation gained prominence due to its high oil yield ability, which makes India self-sufficient in edible oil production. So far, an area of 3.69 lakh ha has been covered under oil palm cultivation with fruiting area of 1.89 lakh ha. Palm oil production in India during 2020-21 is recorded as 0.29 million tonnes, of which the state of Andhra Pradesh alone contributed about 83.32% to palm oil production. The cultivation of oil palm has a significant economic impact in increasing nation's GDP and employment generation in rural areas.

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Oil palm produces two types of oils from the same fruit – palm oil from the flesh or mesocarp and palm kernel oil from the seed or kernel inside the hard-shell mesocarp. The kernel also yields a residual product known as palm kernel meal, which is mostly used for animal feed. Palm oil contains an equal amount of unsaturated and saturated fatty acids; this property is unique among all vegetable oils and fats. About 50% of its composition is made up of saturated fats, primarily palmitic acid (44%), with smaller amounts of stearic acid and myristic acid. The remaining 50% comprises unsaturated fats, including oleic acid (a monounsaturated fat) and linoleic acid (a polyunsaturated fat). This balance of saturated and unsaturated fats contributes to palm oil's stability, versatility, and its ability to give products a longer shelf life. This ability to stabilize and extend the shelf life of most of the products made it a promising source as an ingredient in food, pharmaceuticals, cosmetics and oleochemical industries. Oil palm is valuable not just for its high oil output, but also for the byproducts it produces. Palm oil can be used in cooking, food processing industries, and cosmetics, whilst palm kernel oil is used to make soaps and detergents. This article is all about the applications of palm oil and palm kernel oil in food industries for the preparation of edible products.

2. Palm Oil Utilisation in Food Products

Palm oil and palm kernel oil are important feed material in food applications. This is due to their unique free fatty acid and tri-glycerides compositions as well as thermal properties. About 80% of the oils are used in food applications. Common products made from palm oil and palm kernel oil, wholly or blended with other oils include frying and cooking oil, shortenings, vanaspati, margarine's, confectionary and non-dairy products etc.

2.1 Cooking oil: Palm oil and refined, bleached, and deodorised palm olein are the main source of frying oils in food industry globally. They have excellent oxidative and frying stability due to its composition. The RBD olein is the conventional cooking oil that has light yellow in colour. It is produced by the conventional physical refining technology under vacuum at high temperature (240-260°C) which leads to destruction of carotenes (red colour).

Fig. 1 Palm oil as a cooking oil

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2.2 Shortenings: Palm oil is a key ingredient in the creation of shortening due to its semi-solid nature. No hydrogenation is required to make it shortening. Because of its versatility, palm oil can be specially formulated to meet the needs of a certain application. There are various shortenings, depending on its applications. Shortenings made from palm oil are commonly used in bakery goods including cakes, biscuits (cookies), cream fillings, pastries, and bread, and also in specialty meat products like chicken and beef patties, frankfurters and sausage were also shown to have great potential.

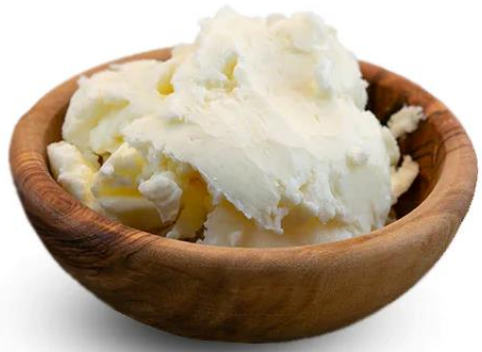

Fig. 2 Shortening

2.3 Margarine: Margarine is described as a liquid or plastic emulsion that is fortified with vitamin A and has a minimum fat content of 80% and a maximum water content of 16%. Typically, liquid vegetable oil and hydrogenated fats are combined to make margarine's fat. Trans fatty acids, which are detrimental to human health, may be included in the hydrogenated fats used. Nowadays, it's popular to use as much liquid un-hydrogenated oil as feasible. Palm oil and palm kernel oil products were found to be suitable ingredients for all types of margarine.

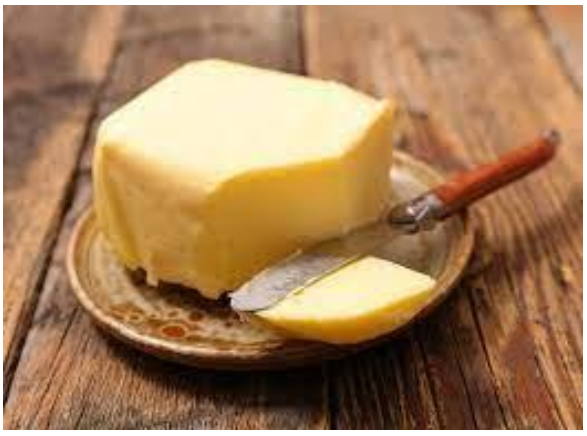

Fig. 3 Margarine

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2.4 *Trans* free Vanaspati: Vanaspati is a substitute or imitation of ghee. Pure ghee is made from Butter oil/fat. Traditionally, vanaspati is made from hydrogenated vegetable oils like soyabean, rapeseed, and sunflower oils. However, the hydrogenation of oil produces unfavourable *trans* fatty acids. Nowadays, *trans* free vanaspati can be made from palm oil and its products that have similar physical characteristics at ambient temperatures to vanaspati, without going through hydrogenation. Interesterification of palm oil and its products can improve the appearance and consistency of *trans* free vanaspati.

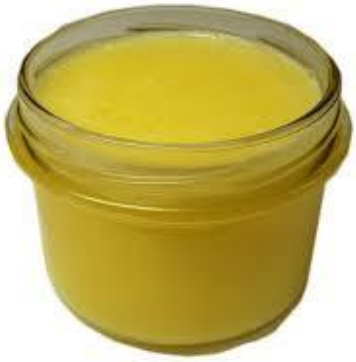

Fig. 4 Vanaspati

2.5 Palm based processed cheese and yogurt: Palm oil can be one of the fats in making cheese-like food. According to a study, processed cheese can be prepared using blend of 30% palm oil and 70% palm kernel olein. For palm-based yogurt, skimmed milk powder is used along with a palm blend comprising 30% palm oil and 70% palm kernel olein. Palm based yogurt is also healthy as it is free from cholesterol and palm blends which ensure the presence of essential fatty acid and vitamin E.

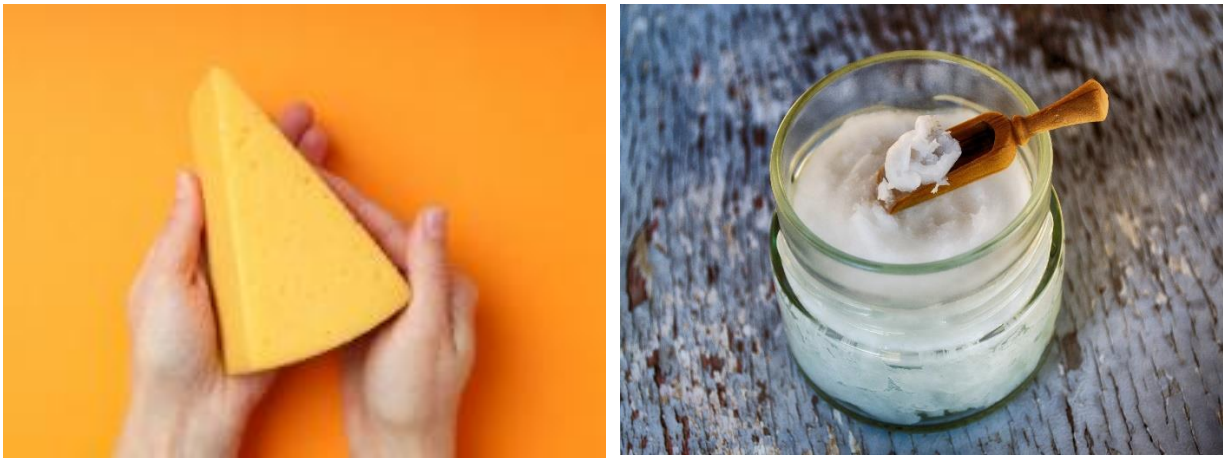

Fig. 5 Cheese and Yogurt

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2.6 Baked Products: Fat is used in bread making to ensure a better texture and longer shelf life. An excellent shortening for bread is 100% RBD palm oil. Similarly, shortening is required in biscuit manufacturing for the dough, cream, and also for spraying. Palm oil is a suitable candidate for all three applications. The oil or fat used for biscuit dough should prevent fat bloom and improve the shelf-life. Generally, a blend of two or more oils is used. Palm oil rich in palmitic acid can be successfully used with other vegetable oils rich in oleic, linoleic, or linolenic acids. For use in the biscuit cream, the oil/fat should have a high solid fat content (SFC) to maintain the texture and a melting temperature close to body temperature for complete oral melt. Hydrogenated palm kernel oil (PKO) or hydrogenated palm olein have been successfully used in the United Kingdom biscuit industry. Spraying the biscuits with oil after they are baked provides them a richer taste and glossy appearance. For this the oil should have relatively low SFC at ambient temperature and high oxidative stability as it is exposed to air and heat. Both palm oil and palm olein can be used as biscuit spraying oils.

Fig. 6 Bread and Other bakery products

2.8 Other uses: Ice cream is an oil-in-water (o/w) emulsion containing milk solids. Vegetable fats having a high solid fat content at 0°C and melting point of 35-37°C can be used to replace the milk fat. Palm oil, with a similar solid fat content profile to butterfat, is one such oil with suitable characteristics for ice-cream formulations. Palm oil is also used in the formulation of filled milk powders. Filled milk powder is produced by replacing milk fat with vegetable fat followed by spray drying of the product. This helps in reducing the cholesterol content of the product and also makes it suitable for lactose intolerant consumers. Generally, oils with high oxidative stability and bland taste such as palm oil and palm olein are suitable for use in filled milk powders. Popular choices for coffee whiteners' formulations are 100% palm oil and 100% palm olein. Whipped toppings are commonly used on coffee, ice cream, puddings, sodas, and cakes. Stability of the whipping cream is a critical aspect, particularly in hot climates. Palm oil based whipped toppings are more stable and functional than dairy whipping cream. This may be

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due to higher oleic acid content and unsaturation of palm oil which has a positive impact on the stability of foam. Palm olein is also used in the formulation of salad dressings. In addition to being cost effective, it is also oxidatively stable due to its lower iodine value and high content of Vitamin E. Palm oil is also used as an ingredient in dry soup mixes because of its high solid fat content and stability

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