

Interview: Dr Sivaruby

Oil Palm offer trans acid free margarine, probably the healthiest margarine.

TFA is a concern to consumers. We always want to make sure our food does not contain TFA. I am Sivaruby, a scientist working in the area of food technology at MPOB. I am going to tell us how TFA are produced during food processing and which food contain this.

Why is margarine from palm oil healthier than margarine from other oil crops?

Margarines, shortening and frying fats are commonly associated with TFA.

Soybeans, canola, sunflower and olive oil are liquid oils. They remain liquid at temperatures below 0°C. Hence it is not possible to produce margarines with these oils without additional chemical process.

Hydrogenation is required to harden these oils. Hence partial hydrogenation is carried out to obtain solid fats from these oils. This results in formation of trans fatty acids. *Trans* fats raise your LDL (bad) cholesterol and lower your HDL (good) cholesterol, which leads to increased cardiovascular diseases, diabetes, obesity, infertility and various cancers.

In palm oil this is different. Palm oil at room temperature is semi solid, hence is a very convenient to turn it into margarine without hydrogenation. The amount of *trans* fatty acids reported in refined palm oil and its products ranged from 0.0% to 0.6%. Palm oil, palm kernel oil and its fractions have positioned themselves as the best commercially available solution to successfully eliminate *trans* fatty acids from the food chain.

Why is margarine trans-fat free?

Here is the science behind it. Palm oil is high in saturated fatty acids which many people think is a bad thing. The saturated fatty acids have more solid fats besides making it a stable fat under high temperature. In the process of making margarine, hydrogenation is not needed for palm oil. This is a chemical process where hydrogen is added. In fact, palm oil is so unique where it has an equal amount of saturated fatty acids to unsaturated fatty acid.

Soybean, canola, sunflower and olive contains more unsaturated fatty acids that make them liquid oil. In order to turn them into semi solid margarine, hydrogenation is needed and that results in the formation of trans-fats.

Here is how it is processed. The solid and liquid portions in palm oil is fractionated or separated. Palm olein is the liquid portion and used as cooking oil. Palm stearin is the solid fraction to make margarine. Since it is naturally semi solid, no hydrogenation is required.

Margarine from palm oil is cheaper than other margarine. Is the quality lower?

But often people think, because margarine from palm oil is cheaper, it is of lower quality. The perception is when the price is higher, the quality is also better. Oil palm produces 3.5 tonnes of crude palm oil/hectare/year. Soybean only produces an average of 0.43 tonnes of oil/hectare, sunflower is 0.65 tonne/hectare/year, canola oil 0.76 tonne/hectare/year. This makes the production of palm oil very cost-effective.

To make margarine from soybean oil or other oils, as I said, they have to be hydrogenated because they are liquid at room temperature. This process uses nickel, a type of metal as a catalyst. After hydrogenation, a refining is required. These two processes – hydrogenation and refining incur cost. For palm oil, we only have to separate the various components into liquid and solid fats. This is not an expensive process. Higher price does not mean higher quality.

There is another factor. The imported margarines /fat spreads require refrigeration during transportation and storage.

These are the factor that makes soybean oil, sunflower, canola oil and olive oil, and their products expensive. Palm oil is not cheap because it is off its interior quality or offer lesser health benefits but it is actually value for money.

Which foods contain trans-free margarine and shortening?

Now we know margarine and shortening from palm oil is trans-fat free. You will want to know the products that contain these. Bread, bun, biscuits, cakes, pastries and all confectionery contains margarine and shortening. All local manufacturers use palm-based products, whereas, imported confectioneries most likely have margarine from temperate oils.

How is the quantity of trans-free fat determined?

We use the iodine test. Iodine combines with unsaturated fatty acids. The more unsaturated the oil, the more iodine will combine. And unsaturated oil requires more hydrogenation. The iodine value for soybean is between 115-125, sunflower is 145, canola is 110-115.

What are the other benefits of the solid fats in palm oil?

Besides margarine, palm oil produces many other oil-based food ingredients.

The advancements in the fractionation process churns out various fractions with unique and specific characteristics. These fractions open up wide use of the palm oil based oils and fats.

They are used in shortenings, vanaspati, filled milk, infant formulas, creamers, mayonnaise, whipped topping, salad dressing, confectionaries, cheese analogues, ice creams, dairy fat replacers and animal fat replacers. All these make palm oil very versatile and foods made from these ingredients trans-fatty acid free.

Reference

Chavarro, J E; Rich-Edwards J W; Rosner, B A and Willett, W C (2007). Dietary fatty acid intakes and the risk of ovulatory infertility. *Am. J. Clin. Nutr.*, 85: 231-237.

Chavarro, J E; Stampfer, M J; Campos, H; Kurth, T; Willett, W C and Ma, J (2008). A prospective study of *trans* fatty acid levels blood and risk of prostate cancer. *Cancer Epidemiol Biomaker Prev.*, 17: 95-101.

Fomuso, L B and Akoh, C C (2001). Enzymatic modification of high-laurate canola to produce margarine fat. *J. Agric. Food Chem.*, 49: 4482-4487.

Gosline, A (2006). Why fast foods are bad, even in moderation. *New Sci.*, 6: 12.

Khatoon, S and Reddy, S R Y (2005). Plastic fats with zero trans fatty acids by interesterification of mango, mahua and palm oils. *European Journal of Lipid Science and Technology*, 107: 786-791.

Makeri, M; Sahri, M M; Ghazali, H M; Ahmad, K and Muhammad, K (2019). Polymorphism, textural and crystallization properties of winged bean (*Psophocarpus tetragonolobus*, D.C) oil-based trans-fatty acids free ternary margarine blends. *LWT - Food Science and Technology*, 100: 158-166

Noor Lida, H M D; Rafidah, A H; Sivaruby, K; Wan, R I A; Norazura, A M H; Nur, H I; Zaliha, O and Miskandar, M S (2017b). Palm oil and palm kernel oil: Versatile ingredient for food applications. *J. Palm Oil Res.*, 29: 487-511.

Oil World 2018/2019.

Sivaruby Kanagaratnam; Teng Kim Tiu; Nur Haqim Ismail; Norazura Aila Mohd Hassim; Wan Rosnani Awg Isa and Noor Lida Habi Mat Dian Characteristics of Retail Refrigerated and Non-refrigerated Margarines/Fat Spreads Sold in Malaysia, Journal Oil Palm Research, Doi:[https://Doi.Org/10.21894/Jopr.2021.000](https://doi.org/10.21894/Jopr.2021.000)

Tang T S (2002). Fatty acid composition of edible oils in the Malaysian market with special reference to trans-fatty acids. *Journal of Palm Oil Research*, 14: 1- 8.

van Dam, R M; Stampfer, M; Willett, W C; Hu, F B and Rimm, E B (2002). Dietary fat and meat intake in relation to risk of type 2 diabetes in men. *Diabetes Care*, 25: 417-424.

Wang, Q; Afshin, A; Yakoob, M Y; Singh, G M; Rehm, C D; Khatibzadeh, S; Micha, R; Shi, P; Mozaffarian, D; Ezzati, M and Fahimi, S (2016). Impact of nonoptimal intakes of saturated, polyunsaturated, and trans fat on global burdens of coronary heart disease. *J. Am. Heart Assoc.*, 5: e002891.