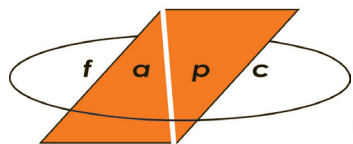


Food & Agricultural Products Center



FLASH!!

OKLAHOMA STATE UNIVERSITY™

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Not All Vegetable Oils are Good for Frying Foods

STILLWATER, Okla. – Fried foods are one of the most popular products consumed throughout the world. The quality of fried foods depends not only on the type of foods and frying conditions, but also on the type of oil used for frying.

Oils and fats play a dual role during the frying process, said Nurhan Dunford, oil/oilseed chemist for the Food & Agricultural Products Center. They serve as a heat transfer medium between the food and fryer, and they also affect the texture and flavor characteristics of the finished product.

“Saturated fats are quite stable against oxidation and polymerization during frying,” Dunford said. “They also add structure to some products because of their high melting point; however, too much saturated fatty acid in a cooking fat or oil may adversely affect the product by resulting in an unpleasant waxy-mouth feel.”

The U.S. Food and Drug Administration dietary guidelines states, “Consuming diets low in saturated fat and cholesterol is more important in reducing cardiovascular health disease, than consuming diets low in total fat.”

Monounsaturated fatty acids, or MUFA, mainly oleic acid, are still relatively stable against oxidation due to their low melting point. Oleic acid-rich frying oils provide a light taste to fried foods as compared to tallow or soybean.

Frying oils rich in MUFA may also improve the appearance of the fried products by facilitating richer color and a glossy surface formation. Oleic acid is also considered as being heart healthy.

“The success of Mediterranean diet and the healthy image of olive oil are attributed mostly to their high oleic acid content,” Dunford said.

Polyunsaturated fatty acids, or PUFA, are rich vegetable oils from plants such as soybean, sunflower and wheat germ that have a very good nutritional image because they help consumers to lower their cholesterol levels and reduce cardiovascular heart disease risk.

Oils with high levels of PUFAs are successfully used in salad oils and dressing; however, they have distinct disadvantages when used for frying foods for industrial purposes.

The rates of formation of polymers, cyclic fatty acids and other undesirable degradation products are increased during heating when oils with high PUFA content are used to fry foods.

Small quantities of PUFAs may be desirable to develop specific flavors, Dunford said.

“For example, oxidation products such as aldehydes formed from PUFAs may contribute to desirable flavor characteristics of the fried foods,” she said. “However, the type of aldehyde formed from PUFAs depends on

the fatty acid structure and may vary significantly in their flavor type and intensity.

Researchers at the University of Minnesota have shown that toxic compounds such as 4-hydroxyalkenals including 4-hydroxy-2-trans-nonenal, or HNE; 4-hydroxy-2-trans-hexenal, or HHE; 4-hydroxy-2-trans-octenal, or HOE; and 4-hydroxy-2-trans-decanal, or HDE, are formed in highly unsaturated vegetable oils when heated under typical frying conditions 300 to 400°F or 185°C.

It is believed that HNE is derived from oxidation of linoleic acid, which is the major fatty acid in many of the vegetable oils including soybean, sunflower and corn oils. These oxidation products have been shown to be toxic and mutagenic.

According to the University of Minnesota report, “Toxicity of these compounds arises because they are

highly reactive with proteins; nucleic acids, such as DNA and RNA; and other biomolecules.”

These toxins accumulate in the oil with repeated heating or reuse for frying, Dunford said. There is no ideal frying fat/oil that is suitable for every frying application,

“Different types of products, frying conditions, storage and expected shelf life of the frying oil and the finished product determine the oil specifications,” she said. “Most of the time frying oil selection has to be a compromise of at least three factors, which include functionality, nutrition and cost.”

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