



NUTRITIONAL VALUE

of saturated and unsaturated lipids

There are numerous studies on the possible harmful breakdown products of deep-frying oils and the consensus reached is that it is a complex matter. Internationally and locally regulations have been established to control the over-utilisation of frying oil and two analytical methods, namely the total polar components and the total polymerised triglycerides, were chosen for control.



The oils and fats research team at the Council for Scientific and Industrial Research (CSIR) conducted several industrial frying studies and applied traditional quality tests. A comparison of different oils under deep-frying conditions was made and the tests continued to indicate that the frying oils rarely weaken to such an extent that the discard point is reached.

Various studies have been done for the Oilseeds Advisory Committee (OAC) and they indicate that sunflower oil, as representative of the polyunsaturated oils, does not reach the discard point at the end of the frying test.

This means that the two mentioned regulatory methods are not sufficiently sensitive to monitor frying oils' possible harmful properties. However, there are strong indications from industrial trials that monounsaturated oils are more resistant to oxidation than polyunsaturated. There is also unquestionable evidence that savoury snacks must be produced in monounsaturated oil, otherwise they cannot successfully sustain their shelf life.

Latest information

The November/December 2014 edition of *Inform* reported on a study by Martin Grootveld and collaborators who applied nuclear magnetic resonance techniques to separate and quantify lipid oxidation products.

This study highlights the primary (nine compounds) and secondary degradation products (22 compounds) of frying oil, and particularly points out the nine different aldehydes that can be formed. Aldehydes, namely the group of extremely reactive oxidation products, react with other molecules during the frying process and can also react with amino acids and peptides after absorption in the human body.

The best known is acrylamide, which has already been studied thoroughly and for which tolerance levels are determined. Examples of nuclear magnetic resonance analyses of different types of oils are available, as shown under deep-frying conditions and graphically demonstrating the dramatic difference between sunflower and olive oils, for instance.

It has also been proved that shallow frying in a pan causes even

greater degradation of frying oil than is experienced during deep-frying. The explanation for this is that there is significantly more oxygen present during shallow frying, while only limited exposure to air and oxygen occurs during deep-frying.

The article provides information on the number of lipid oxidation reactions that can occur in human food and what the toxic and/or pathogenic consequences could be. The author is not qualified to express an opinion on these aspects and wishes to obtain the opinions of medical researchers on these matters. The chemical analyses are indeed reliable, and the author believes that the observations stating that polyunsaturated oil produces substantially more reactive aldehydes than monounsaturated oil, are indeed credible.

This article also offers potential solutions and it is of practical value at this stage that consumers should preferably use monounsaturated and saturated fats or oils for deep-frying, and especially for shallow frying. This means that olive oil, high-oleic oilseed oils, palm oil and coconut oil are given preference. Even animal fats may be used for this purpose.

Polyunsaturated vegetable oils, such as sunflower, canola, maize and others, remain crucial for the provision of essential fatty acids, tocopherols and sterols, but should not be used for deep or shallow frying.

These guidelines will undoubtedly have an impact on the oilseeds industry and influence existing markets. Fortunately, there is already diversification in progress in oilseeds and vegetable oil products and in case the food industry has to adapt, alternatives are available.

Controversial expert opinions

The June 2015 edition of *Inform* contains the article 'Big fat controversy' by Laura Cassidy. Certain aspects of the article are summarised below, with an attempt to highlight the main trends affecting the oilseeds industry.

The article graphically illustrates that the consumption (kg/person/year) of butter, animal fats and margarine has changed from

1909 to 1999 in the United States.

It is especially butter intake that dramatically dropped after 1939, and margarine and plant fats which dramatically increased. The consumption of vegetable oils (soya, cotton and maize) also increased dramatically.

The key to this growth was the use of hydrogenation in the liquid vegetable oils to convert them to fat and increase their stability at the same time. The consumption of soya oil increased a thousandfold and margarine consumption twelvefold. The consumption of butter and animal fats declined by roughly fourfold. Since the 1960s, the culprits, saturated fat and cholesterol, have gradually been replaced by carbohydrate foods (pasta, cereals, sugar, fruit and starch) to currently represent an estimated 50% of energy intake.

It is explained that the effect of dietary lipids on the harmful low-density lipoprotein (LDL) cholesterol and the beneficial high-density lipoprotein (HDL) cholesterol has limited diagnostic value, and that the ratio of total to HDL cholesterol in serum is a better risk indicator. It is currently assumed that saturated fats in the diet have little effect on the total to HDL cholesterol ratio. This suggests that no relationship between heart disease and saturated fat intake exists.

Polyunsaturated fatty acids (linoleic acid, for instance) do, however, lower the total to HDL cholesterol ratio. At the same time, it was found that monounsaturated fatty acids (such as oleic acid) reduce the ratio even more. This result has confirmed the position of monounsaturated vegetable oils, such as olive and high-oleic oils, as healthy oils. There is also confirmation that trans-monounsaturated fatty acids significantly increase the ratio of total to HDL cholesterol, and

therefore this type of fatty acid is classified as unhealthy.

The author expects that the *Dietary Guidelines for Americans*, the United States government's main source for nutrition advice, should soon reflect the findings of the past five years. However, the opinions of experts discussed in the article suggest that there are strong differences of opinion.

There are certainly indications that oilseed producers in the United States, with encouragement by food manufacturers, will implement the conversion of normal polyunsaturated soya, canola and sunflower to monounsaturated (high-oleic) types of products. It therefore represents a midway that should satisfy most nutritionists.

Regulations for trans-fatty acids

In this regard, South Africa has advanced beyond the United States and already had regulations in place two years ago. The United States Food and Drug Administration (FDA) issued its final statement on the presence of partially hydrogenated fats in food on 16 June 2015.

This also seems to be a thorny issue in the United States, and according to the 24 June 2015 edition of *Inform Smartbrief*, the weekly email newsletter for fats and oils professionals, there was a webinar discussion arranged on the same date with FDA legal experts to reflect on the matter.

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