

that India accounts for 10% of the world's edible oil consumption. Mentioning about the major oilseeds, he quoted that groundnut, soy bean, and rape/mustard seeds account for 80% of the total oilseeds grown in India. According to him, the total availability of vegetable oils is about 7.5MT, which is not adequate to meet the domestic demand. The processing industry and the solvent extractors suffer from pervasive sickness because of insufficient and high-cost of raw material and uncompetitive processing makes oils and oil mills and affects export prospects, which is further eroded by invasion of low priced imported oils.

This was followed by a presentation on the "Chemical composition and nutritional significance of dietary fats", by Dr. Vajreswari, Deputy Director, NIN. She started her presentation by stating that this topic forms the basis for formulating guidelines for right quality of visible fat consumption. She described the chemical nature of dietary lipids, different classes of fatty acids, the bioconversion of fatty acids, changes in nutritional quality due to processing at industrial and household level and highlighted the characteristics of ideal fat for deep fat frying.

TECHNICAL SESSION - II

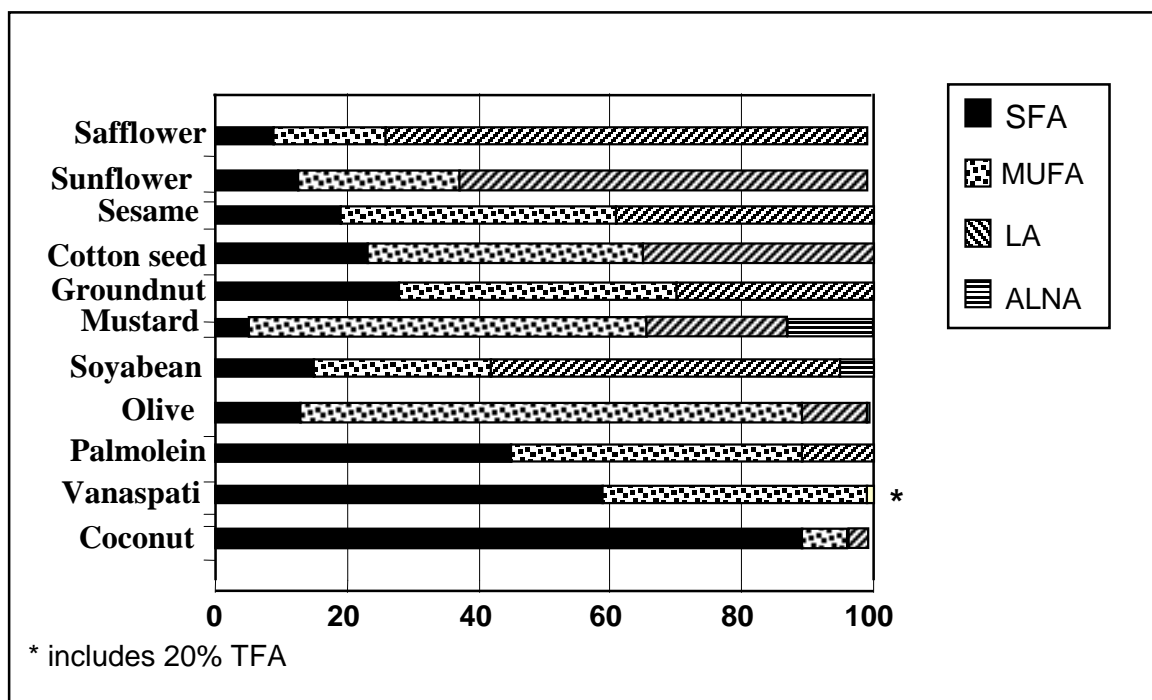
Chairperson - Dr. Kamala Krishnaswamy
Former Director, NIN

Rapporteurs - Dr. (Mrs) Kalpagam Polasa, Dy. Director, NIN
Dr. M. Raghunath, Dy. Director, NIN

The first speaker of the session was Dr. Ghafoorunissa, former Deputy Director (Senior Grade), NIN. She spoke on "Dietary fats: requirements to meet nutritional needs and prevent insulin resistance (IR) and athero-thrombogenesis". Dr Ghafoorunissa updated the current concepts on metabolic risk factors of syndrome 'X' and athero-thrombogenesis. She provided an overview on the central role of dietary fats in modulating several interrelated metabolic events that lead to IR and athero-thrombogenesis and summarized from several international recommendations the safe range of intake of various fatty acids, cholesterol and the need for maintaining good antioxidant status for ensuring optimal health and for prevention of diet related chronic diseases. Her presentation encapsulated the research done at NIN on the quantity and fatty acid composition of invisible fat, visible fat requirement, fatty acid intake in rural and urban populations, PUFA Nutritional Status of Indian Adults, Anti-/pro-atherogenic Effects of Fats and Oils (ghee, palmolein, mustard, canola, sunflower) in relation to groundnut oil as well as varying doses of fish oil supplements. Based on the above studies, she recommended the following:

1. Increase in visible fat in diets of rural and urban poor from <12 g/person/day and decrease in urban middle income and high-income groups from >40 g/p/day to the amounts recommended according to age, physiological status and physical activity.
2. Moderation in linoleic acid intake (LA (n-6)) from visible fat, increase in alpha linolenic acid (ALNA (n-3)), reduction in saturated fatty acid (SFA) and trans fatty acids (TFA) in the total diet (visible and invisible fat). For achieving this, she recommended the use of preferred vegetable oil(s) along with ALNA containing oil(s) or vegetable oil(s) containing high LA (n-6) along with moderate LA (n-6) or low LA (n-6) containing oil(s). However, she added that the latter combination would ensure moderation in LA intake only and is therefore recommended when fish is consumed or when other dietary components provide adequate ALNA (n-3).
3. She emphasized that balancing fatty acid intake by selecting appropriate combination of oils at household level, gives option to the consumer to select oils according to availability, cost and culinary practice.
4. She stated that according to PFA (Prevention of Food Adulteration Act) 4th Amendment Rules 1992, blending of any two vegetable oils (wherein the component oil used in the admixture is not less than 20%) has been permitted so as to increase the overall availability of oils of consumers' choice.
5. She suggested blending of vegetable oils as per the combinations presented in order to ensure optimal health benefits.

Fig. Fatty Acid composition of Dietary Fat and Oils



Recommended Oil Combinations (1:1) In Indian Diets	
↓ LA (n-6) ↑ ALNA (n-3)	↓ LA (n-6)
Groundnut/Sesame/ Rice bran+ Mustard Groundnut/Sesame/Rice Bran+Canola Groundnut /Sesame/Rice bran+Soyabean Palmolein / Olive +Soyabean Safflower/Sunflower+Palmolein/olive + Mustard	Sunflower/Safflower+Palmolein/Olive Safflower/Sunflower+Groundnut / Sesame/ Rice bran
Additional advantage other than phytosterols and vitamin E: Sesame - Lignans; Ricebran-T₃ and Oryzanol; RPO/Palmolein - Carotenes/T₃; Olive oil - polyphenols In view of the regional preferences, choose combinations of oils and fats, that are able to provide the prescribed ratios of n-6 and n-3 fatty acids Use low PUFA containing oils with natural anti-oxidants for deep frying	

Dr. Ghafoorunissa reiterated that the minor components of fats and oils have hypocholesterolemic and antioxidant properties. She pointed out the recent studies that have demonstrated synergism in the beneficial effects of minor components of vegetable oils. Therefore, she suggested that use of more than one oil provides this additional advantage.

Dr. Ghafoorunissa, concluded her talk with a recommendation to ensure optimal quantity and quality of fat in total diet throughout life, which may significantly contribute to decreased incidence of low birth weight and chronic under-nutrition, at one end of socioeconomic spectrum and diet related chronic diseases in late adult life at the other, in the Indian population.

Dr. Kalyanasundaram, Scientist of PORIM (Palm Oil Research Institute of Malaysia), Malaysia presented his paper on "Health effects of the Trans Fatty Acids – implications for the oils and fats industry". Dr. Kalyanasundaram pointed out that increase in the intake of trans fatty acids (TFAs) is a global phenomenon. While Western and European countries have made attempts to reduce its intake, hardly any such efforts have been made in developing countries like India and Pakistan. The issue of TFA arose in the West, when it was propagated that consumption of Margarine is a good substitute for hydrogenated fat. But Margarine contains high amounts of TFAs, which have adverse effects on health. For example, TFAs increase total and LDL (Low density lipoprotein) cholesterol in blood and decrease HDL (High density lipoprotein) cholesterol, thus adversely affecting LDL/HDL ratio.

TFA consumption increases lipoprotein Lp (a) and is positively associated with CVD risk in all population-based studies. Indeed, TFA has more adverse effects than SFA vis-à-vis blood lipids, CVD risk etc. He said that Lauric and Myristic acids as SFAs are as bad as TFA in their effects on blood lipids and CVD (Cardiovascular disease) risk, while other saturated fatty acids like stearic and palmitic acids are better. He reiterated that as TFAs have no health benefits, one cannot establish their RDA or requirement. He also pointed out that USA, Canada and Denmark have indeed passed legislation to work towards 'zero' TFA levels in foods. He suggested that an alternative to consumption of solid fats rich in TFA would be through improved chemical or enzymatic interesterification. Interesterified fats (FAS) do not affect total or LDL cholesterol, however, they decrease HDL cholesterol, which is not desirable.

Speaking on the "Dietary fats and cancer", Dr. B.R. Lokesh of Central Food Technological Research Institute (CFTRI), Mysore, stated that there are 3 million cancer patients at any given time in India and at least one million new cases are added annually, while 2.5–3 lakh people die annually due to cancer. Dr. Lokesh mentioned altered membrane fluidity, modulation of hormone levels, intracellular communication and subversion of immune system could be the possible mechanisms through which fats promote carcinogenesis. Dr. Lokesh also presented data on consumption of n-3 oils and their modulatory effects on prostaglandin (PG) levels, especially PGE₂ (prostaglandin G₂). He said that presence of n-3 rich oils in cell culture medium makes the cells sensitive to chemotherapeutic agent like adriamycin. He observed that n-6 fatty acids promote cancer, while n-3 fatty acids have inhibitory effect.

He concluded that saturated fat and n-6 PUFA promote cancer cell growth. It acts through immunosuppressive pathway and production of PGs of 2 series. Oils with nutraceuticals (tocotrienols) may be helpful in view of their inhibitory effect, n-3 PUFA should be included in diet. He ended the talk by posing a question - what should be an ideal level of n-3 level in Indian diet to combat cancer?

Dr. S.R. Gupta, Dy. Director General (PFA), Directorate General of Health Services made a presentation on 'Regulatory requirements in relation to fats and oils', wherein he briefly gave an outline of the regulatory aspects related to fats and oils with specific reference to the Prevention of Food Adulteration (PFA) Act of India. He also covered issues such as the provisions under the Act for standardization of Oils, permitted and non-permitted additives, labeling requirements under PFA and problems of misbranding and claims.