

# OIL TECHNOLOGISTS' ASSOCIATION OF INDIA

JANUARY 2017 - MAY 2017

EASTERN REGION



FOR LIMITED CIRCULATION



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## ***CONTENTS***

<i>Sl. No.</i>		<i>Page No.</i>
1.	From the Editor's Desk	1
2.	Message from President (Previous)	2
3.	About Ourselves	3
4.	Hazards of Reusing Cooking Oil Dr. Surjit Kumar Saha	4
5.	Adulterated Food : A Storehouse of Diseases Dr. Jagadbandhu Chakrabarti	9
6.	Pick of the Bunch	12
7.	Parliament News	22
9.	Book Reviews	27

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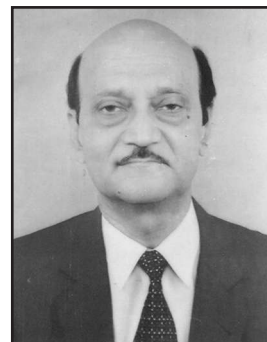
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## From the Editor's Desk



It is quite interesting and relevant to have a look at the minutes of the last C.E.C. held in Calcutta and note that the President expressed discomfort at the lack of Initiative in the extension/ Awareness Programme among the common people regarding the deleterious health effects of lipid peroxidation products generated in culinary use of the recycled oils and fats at high temperature even though it was impressed upon in the "Message" at the time of taking charge. The Message was actually addressed way back in 2013 when I took over charge as the First servant(President) OTAI. I also mentioned therein about the carcinogenic compounds formed in the process are Acrylamide, Malonaldehyde to name a few. Photocopy of the (President's Message in 2013) Enclosed for perusal.

A bit of awareness in our Indian kitchen may be of great help towards the wellbeing and safety of human health.

2. I provide and share with all the members about the latest information being provide in the A.O.C.S Journal "The Dawn of Keto-neurotherapeutics?"

In human the brain function requires a lot of energy, roughly 22% of the body's daily energy intake. The brain's main fuel is glucose which is normally abundantly available both from dietary carbohydrates and from glucose made in the body via gluconeogenesis. The problem for the aging brain is not glucose supply but it's deteriorating ability to take up and use glucose available in the blood. The tendency, as we age is to become more sedentary and gain a little weight ,which makes it harder to metabolise glucose . This often leads to mild glucose intolerance which commonly progresses to Type 2 diabetes, a major risk factor for cognitive decline during aging . Cognitive decline can remain relatively innocuous but also may progress to Alzhemier's Diseases, in which worsening memory problems leave people incapable of caring for themselves and managing on a day to day basis.

*Probable remedy* : KETONES HELP TREAT COGNITIVE PROBLEMS.

Wish you a Healthy & Happy life.

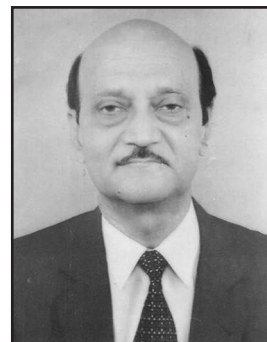
S. K. Roy  
Editor

*Ack/Courtesy* : "Inform" for limited scholarly circulation



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## Message from President



The Oil Technologists' Association of India (OTAI) was founded in 1943 by Late Rao Saheb D. Y. Athwale, Ex principal of H.B.T.I., Kanpur. I on behalf of all the members bow my head to this great visionary who has brought the members of the discipline of oils, fats and allied products, together under one umbrella. The Institution has its National and International recognition. The main objective of OTAI is to work for the advancement of chemistry and technology of oils and fats and their derived products. It is a Civil Scientific organization. Our growth is more vertical than horizontal.

I took over charge from Dr. R. B. N. Prasad, Former President, on the 9th of August, 2013 during the 68th OTAI-AOCS International Conference held in Hyderabad, under his leadership it had been very well organised and a great success. My very sincere thanks to all of you for unanimously choosing me for the post.

The Legacy moves on. How does it move? It is intense Passion. Passion leads to Intent. Intent leads to Hard work. Hard work leads to success. Success leads to fulfillment, to Happiness, to Tranquility. "O.T.A." probably stands for "Owning Tranquility Assured".

OTAI, being closely associated with Oils & Fats, Oleo-chemicals, Paints, a compact source of Energy, Personal Care, and Decor, the only organisation, which can provide "Health, Wealth and Happiness."

While we are striving hard for advanced technological innovation in different areas for better products, we will be failing in our duties if it does not reach the common man and there is an urgent need for Extension work and Awareness Programme. A common example of which is recycling of Fats and regular deep frying beyond smoke point in Indian Kitchen, which may lead to serious health problems due to the formation of Acrylamaide, Malonaldehyde.

Our organisation is quietly moving towards Platinum Jubilee. Let us join hands and keep the Passion alive. We will make it a Grand Success. Before I sign off.

**"Believe those who are seeking the truth, doubt those who find it"**

**S. K. Roy**

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## About Ourselves

Annual Social meet was held as usual at the premises of Calcutta Blind School. Mr. B. P. Manchanda took a lot of trouble and care for organising this Social Event'

Mr. J. P. Singh, President was present and took active part. Among other Prof Sunit Mukherjee, Dr. Jagatbandhu Ghosh, Dr. Guha, Dr. Mukhopadhyaya was also present.

Among the ladies Mrs. Poonam Singh and Mrs. J. P. Singh were present and actively took part in the Sports. Mrs. Poonam Singh and Mrs. Manchanda actively took part in various activities and Mrs. Poonam Singh organised the "HOUSIE" and it was a great attraction for the members.

Prizes were given to everybody by S. K. Roy, Former President O.T.A.I.

Members present enjoyed the event and promised to come in large numbers next time.

An awareness and input training course was inaugurated at the Subhas Mukherjee Memorial Research Institute. Prof. Mukherjee & S. K. Roy addressed the students about the utility of such courses. The course was a grand Success.



*Team of International Society of Fat Research (I.S.F, USA) with Dr Ms. Chooen May, President (Seated in the Front) and S. K. Roy of OTAI standing in last row (4th from left). I.S.F. meeting was held in Malayasia in October 2016 & 12 Countries participated in three days' conference hosted by M.P.O.B. in Hotel ISTANA, Kualalumpur.*

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## Hazards of Reusing Cooking Oil

**Dr. Surjit Kumar Saha**

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Edible oil is an essential part of Indian cooking and is being used since generations for the taste and flavour it adds to the food items. Cooking food with oil can be broadly classified into three types: Pan frying, Shallow frying and Deep frying. Pan frying means cooking the food in a hot pan with the bottom lightly coated with oil. Shallow frying means cooking the food in oil with a depth that reaches about half of the thickness of the food with the food touching the bottom of the pan all throughout. Deep frying means cooking the food in oil deep enough to cover it to allow the food to float in the oil. Deep frying in oil is one of the most commonly used procedures for the preparation of food which produces flavor compounds and changes the flavor stability and quality of the oil.

During frying, a series of complex chemical reactions such as oxidation, hydrolysis, isomerization and polymerization take place which influence the quality of the final product such as flavor, texture, shelf life and nutrient composition. The influence of these reactions during frying results in the formation of a number of toxic and harmful by-products which are present in both the frying oil and the fried food.

The chemical reactions involved in frying depends on factors like replenishment by fresh oil, frying conditions such as time and temperature, original quality of the frying oil used, type of food materials fried, type of frying equipment used, antioxidants present in the oil and the quantum of oxygen present during frying. Research carried out over the years in many countries have found that high frying temperature, increase in number of times of frying, high content of free fatty acids in the oil and the presence of polyvalent metals in the frying equipment during frying coupled with the quantum of unsaturated fatty acids in the frying oil tend to decrease the oxidative stability, keeping quality and the flavor quality of the frying oil. Natural antioxidants such as tocopherols and ascorbic acid as well as synthetic antioxidants such as propyl gallate, tertiary butyl hydroquinone, etc. which are originally present in the cooking oil tend to reduce the rate of degradation of the cooking oil by decreasing the rate of oxidation of the cooking oil, but the effectiveness of the antioxidants decreases with high frying temperature and increasing number of fryings.

In pan frying, almost all of the cooking oil is consumed by the food fried and there is no

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residual oil. In shallow frying, some part of the cooking oil is used by the food fried, leaving a small residue. However, in deep frying, only a small amount of oil is consumed by the food fried thereby leaving a substantial amount of used cooking oil. Due to heavy usage of cooking oil for frying in restaurants and households alike and for economic considerations, cooking oil is often reused. As per published medical literature, the problem with reusing cooking oil is that upon re-heating, it can create free radicals, which upon ingestion attach themselves to the healthy cells in the human body leading to a number of potential health risks such as irritable throat, hyper-acidity, heart disease, Alzheimer's disease, Parkinson's disease, atherosclerosis, cancer, etc.

The smoke point of an oil is the temperature at which the oil breaks down and begins to smoke. In general, vegetable oils have higher smoke points than animal fats, and refined oils have higher smoke points than unrefined oils. Each time the oil is heated for frying, the smoke point drops. The usual deep-frying temperature is 190 degrees Centigrade. Therefore, cooking oils should have smoke points much above 190 degrees Centigrade. Refined groundnut, ricebran, soybean and safflower oils have high smoke points at 225, 254, 255 and 265 degrees Centigrade, respectively. It has been established by research carried out in many countries that oils with high PUFA (Poly Unsaturated Fatty Acid) content degrade more rapidly on heating as compared to oils with low PUFA content. Also, foods cooked in low PUFA content oils are more palatable as compared to those cooked in high PUFA content oils. Ghee (clarified butter) has a smoke point of 252 degrees Centigrade with low PUFA content and therefore is one of the best frying material but its high cost restricts its use. Partially hydrogenated vegetable oils (Vanaspati) having very low amounts of PUFA and smoke point of about 250 degrees Centigrade are also good frying materials but their high content of trans fatty acids which are positively co-related to atherosclerosis have restricted their use.

In a recent study, it has been found that a toxin called 4-hydroxy-trans-2-nonenal (HNE) is formed when oils rich in PUFA such as soybean, safflower and sunflower oils are reheated. The toxicity of HNE has been confirmed by many medical researches carried out in various countries which have reported a positive co-relation between the consumption of foods containing HNE and increased risks of cardiovascular disease, stroke, Parkinson's disease, Alzheimer's disease, Huntington's disease, various liver disorders, and cancer. Once absorbed in the body, HNE reacts with DNA, RNA and proteins thereby affecting the basic cellular processes. The following are some of the causes and signs of deteriorated cooking oil :-

- Darkening of the cooking oil with use due to burning of the oil and food particles.

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- Increase in the viscosity of the cooking oil due to the formation of various polymeric compounds.
  - Accumulation as sediment or as suspension of loose absorbent particles of the food item fried in the cooking oil.
  - Decrease in smoke point of the cooking oil on use. If the smoke point of the cooking oil reaches 190 degrees Centigrade, the efficiency of frying reduces drastically.
  - Rancid or a strange smell has set in the cooking oil.

In view of the above mentioned causes and signs of deteriorated cooking oils and the associated health hazards, it is imperative that cooking oils should not be reused. However, considering economic concerns and shortage, sometimes, used cooking oils may be required to be reused wherein it is necessary to take the following precautions.

#### ● **Storing Used Cooking Oil for Reuse**

As soon as the cooking oil cools enough to handle, it should be strained through cheese-cloth to remove the food particles and should be stored in a clean glass jar as polyvalent metals present in metallic containers tend to deteriorate the oil by oxidation. This used cooking oil should be refrigerated because unrefrigerated oil becomes anaerobic and leads to the growth of *Clostridium botulinum* bacteria, which causes botulism, a potentially fatal kind of food poisoning. Refrigerating the used cooking oil also retards the onset of rancidity.

#### ● **Use of Low PUFA Content Oils**

Used cooking oils having low PUFA content and high smoke point can be considered safe for reuse, if well-strained, properly stored and having smoke point sufficiently above 190 degrees Centigrade. However, if any smoke or froth is detected during heating, the used cooking oil should be discarded. Moreover, as HNE is more likely to build up in oils with high levels of PUFA, oils such as groundnut, sesame, palm, ricebran and mustard which have low PUFA content should be opted for deep frying. Oils such as linseed, safflower, soybean and sunflower have high PUFA content and therefore these oils should be avoided for deep frying.

#### ● **Avoid High Frying Temperature**

Frying foods above 190 degrees Centigrade can lead to the accumulation of HNE in the oil and also in the food fried. It should therefore be ensured that oils are not heated above 190 degrees Centigrade which is the ideal temperature for frying.



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### ● **Avoid replenishment of Cooking Oil**

It is a general practice to replenish the used cooking oil with fresh cooking oil in the frying vessel which is extremely dangerous and as the used oil not only contains charred food particles but also dangerous chemicals which are detrimental to health. This practice needs to be avoided to prevent the health hazards depicted above.

In a nutshell, it can be inferred that using fresh oil every time for cooking is the healthiest and the best option. But, if this is not a viable option due to shortage or economic considerations, the following guidelines should be followed while reusing the used cooking oil for safe health :

- Excess batter should be shaken off from the food before frying.
- Iron or copper pots or pans should be avoided for frying as these metals tend to accelerate rancidity of the oil.
- Foods should be fried at a temperature of maximum of 190 degrees Centigrade.
- The heat should be immediately turned off after cooking since exposing oil to prolonged heat accelerates rancidity.
- The used cooking oil should be strained through cheese-cloth to remove any food particles before storing.
- The used cooking oil should be stored in a clean glass jar and refrigerated or kept in a cool and dark place.
- Fresh and used cooking oil should never be mixed.

### **Disposal of Used Cooking Oil :**

Proper disposal of the used cooking oil is an important waste-management concern. Despite the hazards of reusing used cooking oil emphasized above, the used cooking oil cannot be simply poured down the drain as it can congeal in pipes and cause clogging of the plumbing lines. This may even eventually go into the water bodies and fresh water reservoirs posing a huge safety and health hazard as oil is lighter than water and tends to spread into a thin and broad film which hinders the oxygenation of water. It has been estimated that a single litre of oil can contaminate as much as one million litres of water. The proper way to dispose of oil is to put it in a sealed non-recyclable container and discard it with regular garbage.

Used cooking oils can be put to many advantageous uses as it does not emit any kinds of hazardous chemicals and is also eco-friendly. As such, the used cooking oils can be used in oil lamps and in heaters. Used cooking oils can be easily converted into biodiesel,

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soaps, paints, cosmetics, animal feeds, lubricating oils and greases which have good economic value. The used cooking oil can therefore either be reused for non-edible purposes or sold to manufacturers of non-edible products.

With the emergence of green technologies, the demand for eco-friendly fuels is increasing day-by day and in this context, the importance of biodiesel as a green fuel cannot be over emphasized. Despite the manifold advantages of biodiesel, the manufacture of biodiesel is seriously hampered by the scarcity of raw materials, mainly the fatty oils. As used cooking oil can be easily converted into biodiesel by alcoholysis, it becomes imperative that an organized collecting system should be developed and enforced to collect the used cooking oils from households and restaurants for ensuring a sustained supply of raw material for manufacture of biodiesel. This will not only improve the economics of production of biodiesel but also generate employment.

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### ***Flashback Inauguration of OTAI (EZ) Calcutta***



*Prof. R. N. Chakraborty (Padmabibhusan) Cutting the Tape*

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## Adulterated Food : A Storehouse of Diseases

**Dr. Jagadbandhu Chakrabarti**

*Ex-Director, Central Food Laboratory, Kolkata*

Urea added to parched rice (Muri); poisonous colour added to flattened rice (chinrah) to look it much whiter, selling tea-leaves once again after extracting and adding colour to obtain closed to tea liquor (truly the coloured water), using Agina Moto (Mono-Sodium Glumate-MSG) in 'chowmein' decorating 'Betels' and 'Laddus' with Aluminium foils (Tabak), mixing 'Shial-Kanta' (Argemone) thorny seeds to edible oils, fruits ripened with the aid of Carbide, Contaminated foods, edibles with fatal colours, rotten betel nuts to 'Pan Masala', Papaya Seeds to black peppers etc; are more or less common sights everywhere in the market. Moreover, manufacturing Companies always indulge in misleading exaggerations on advertisement of their products. This is how Food for Health 'is gradually degenerating into 'Food leading to death'. Or Herbert was quite justified, when 360 years before, he remarked 'whatever was the father of a disease, all ill diet was the mother.'

Because of my long 36 years association by virtue of my official employment as a person responsible for the 'Standard of Food and its Safety' in the Central Government, I am rather interested in sharing my experiences with all of my countrymen by bringing the ins and outs of the edibles. Adding artificial colour of food carries no sense save and except its being amorous. There are four different sheds of basic colours as permitted viz Red (Ponceau 4R, Carmoisine, Erythrosine), Yellow (Tantrazine, Sunset yellow), Blue (Indigo-Carmine, Brilliant Blue FCF) and Green (Fast Green FCF) i.e. total eight varieties of four basic colour. These are recommended for some varieties of food @ 100/200mg. per kg of food quantity. But 'Kamdheni' (Cow brand)/Metanil yellow 'a specific industrial colour and not for human consumption' is being elaborately used in edibles. Bundiya, Laddu, Biryani, Beguni (brinjal slices deeped in Besan or powdered Bengal gram, fried in oil) 'Zelabi, Amriti, Kamala Bhog', 'Kulfi', Math (Congealed sugar shaped like a temple), Batasha, Dalbori etc. wherein this harmful colour is used by the manufacturers knowingly/ unknowingly. This arbitrary use of industrial colour may give rise to the diseases like cancer, stomach-ache and testicular degeneration. Another 'similar harmful colour is Rhodamine-B;' which is widely used in Howai Mithai, Sweetmeats. Syrup and Sugar temple (a temple shaped hardened sugar product, particularly offered to goddess Saraswati, Laxmi specially). Human livers, kidneys and spleens are very badly affected by this dangerous colour.



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Application of above mentioned yellow and red colour has slow poisoning effect in our body. So we are, naturally less conscious. Metanil yellow or 'Kishori Colour and Rhodamine-B' are very easily identifiable a little addition of Muretic Acid (used in toilet cleansing) changes the yellow colour to deep purple. Likewise any food having Rhodamine-B in it, if diluted in water and exposed to sunlight, will have florescence in it. We might remember these two tests in our own interest.

Children below 12 months are strictly advised not to take Agina Motto (MSG) there in Chinese food. MSG causes Obesity, Diabetes, Epilepsy, Autism and affects Eye Tissues, 'Tabak' (A foil of silver) used on the crust of 'Betel-leaf' or sweetmeats should be of Food Grade Silver only (99.9% pure) but instead the use of Aluminium Foil is rampant to save the cost. As a result, human bones become as soft and malleable as sponge and man may also suffer from the loss of memory and mental retardation. Eternal vigilance is the only safeguard against these maladies.

As per the study of the 'World Health Organization' (WHO) there are about 150 crore cause of diarrhea in the whole of the world every year and this disease accounts for the death of nearly 30 lakhs of children below the age group of 5 years.

70% of the enteric diseases are caused by bacteria-infection from food. This infection may take place either at the time of cooking or when the food is left uncovered or at the time of serving it to the consumers. Heat may kill the germs but the toxin (Enterotoxin) that was created during the life-span of the germs is indestructable. Human hands, noses, faces, hair skin, nails, rings & other ornaments, watches, cigarettes, 'Bidis,' 'Khani', 'Betel-leaves' also cause food contamination extensively. Salads prepared under unhygienic conditions may be responsible for causing Giardia. Food may become uneatable for many a reason only a strict vigil can ensure perfect safety.

Plastic containers like Water bottles, feeding bottles, food packets and other packages are liberally used all over the world but the Bisphenol component (BPA) of plastic may contaminate food thus damage man's memory for recollection.

Adulterated food is an age-old problem. But we cannot let it go easily. Acharya Prafulla Chandra Roy discovered how to detect adulteration in edible oils in the year 1885. The Paper was published in the Research Bulletin of the Asiatic Society. Swami Vivekananda advised to enact laws prohibiting adulteration in food. the famous compilation of Swamiji's maxims entitled 'Pearls of Wisdom' published by Ramakrishna Institute of Culture Kolkata; bears evidence to this fact. 'Bengal Pure Food Act' came into existence in the year 1919 and Calcutta Municipal Corporation also made an enactment on food in the year 1923.

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The 1st Central Legislation 'The Prevention Of Food Adulteration Act' was enacted in the year 1954 and came into force since June, 1955. Further the most recent food act has been enacted in India which is 'The Food Safety and Standard Act, 2006'. This integrated Act [(1) PFA Act & Rules. (2) FPO, 1955, (3) MFPO, 1973, (4) VOP order, 1974 (5) Edible oil packaging Reg.) order, 1988 (6) SEO, De-oiled Meal & Edible Flour (Control) order, 1967, (7) Milk & Milk Products order, 1992, (8) Essential commodities Act, 1955 (relating lo food.)] is consistent with the world standard as well as the standard of Codex Alimentarius commission, 'Food Safety and Standard Authority of India' under the Ministry of Health and F.W., Govt of India is in charge of this affair. As per new legislation only Govt./Non-Govt. NABL Accredited Laboratories are entitled to conduct the tests of doubtful food items sold in the market; for the general public. The latest legislation came into force on and from the 5th August 2011.

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***Flashback Inauguration of OTAI (EZ) Calcutta***



*Seated Left to Right Prof. R. N. Chakraborty (Padmabibhusan), S. K. Roy, Dr. A. S. Khanna*

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## Pick of the Bunch

Although the question of which oil is healthiest seems a simple one, there are a variety of factors that affect the health benefits or negative implications of oils, depending, for example, on their use and the temperature they are used at. In order to answer this question, one must consider the composition of fatty acids present in each oil or fat; the scientific assessments of the pros and cons of saturated versus unsaturated fats; an oil's performance when subjected to high heats; vitamin and antioxidant content; the effect each has on chronic diseases such as high cholesterol, heart disease and diabetes; and the various other health claims purported.

### Composition and fatty acids

Fatty acids, which are chains of carbon atoms, differ from each other in the number of carbon atoms and double bonds they contain. There are 21 types of fatty acid found in the diet, which fall into three categories: polyunsaturated (PUFAs), monounsaturated (MUFAs) and saturated (SFAs) fat. They are distinguished by the number of double-bonds they contain.

Polyunsaturated fats contain two or more carbon-carbon double bonds. Monounsaturates contain one carbon-carbon double bond and have a higher melting point than PUFAs but a lower melting point than saturated fats. They are liquid at room temperature although solid or semi-solid when refrigerated. Saturated fats do not contain any double bonds between carbon atoms and have higher melting points, making them solid at room temperature.

Vegetable oils are nearly 100% fat, and fat is an essential nutrient for the body as it is part of all cell membranes. Humans can create MUFAs and SFAs in the body, but are not capable of producing PUFAs. This distinction leads to the definition of 'essential fatty acids' such as linoleic acid and  $\alpha$ -linolenic acid, which must be provided by the diet.

Although the distinction between PUFAs, MUFAs and SFAs appears simple, it does not fully split oils into either healthy or unhealthy.

Crude, corn oil and sunflower oil contain a high percentage of polyunsaturated fats; rapeseed oil, olive oil, goose fat and lard are high in monounsaturated fats; and coconut oil and butter are high in saturated fats.

Table 1 (*following page*) shows the percentages of fat types in some major oils.

According to the American Heart Association, 'bad fats' include trans and saturated fat,

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while 'healthy fats' are MUFAs and PUFAs. It recommends replacing the bad fats with healthier fats to improve heart health. In particular this includes canola, corn, olive, peanut, safflower, soya and sunflower oils, instead of butter, lard, palm and coconut oil. These are oils that contain 4g or less of saturated fat per tablespoon, as well as no partially hydrogenated oils or trans fats.

### **Saturated fat and CHD risk**

It has long been thought that the consumption of saturated fats in the diet is linked to coronary heart disease (CHD) risk. The report '*Saturated fat and heart disease: The latest evidence*', written by Adela Hruby and Frank B Hu and published in *Lipid Technology* in January 2016, considers the latest information on the link between the two. It refers to two large meta-analyses published in 2014 and 2015, which claimed to conclude that there was not an association between saturated fat intake and CHD.

Hruby and Hu's paper examines the controversies and evidence that support how limiting SFAs and replacing them with healthier dietary fats and carbohydrates can lower CHD risk.

The report concludes that, "the connections between high saturated fat intake and CHD risk are real, supported by decades of mechanistic and epidemiological research." It advises a continuation of the current dietary guidelines in the USA that SFAs should make up 10% or less of energy intake for optimal cardiovascular health.

In terms of oil intake, the report recommends replacing SFAs found in certain tropical oils (including palm kernel and coconut oils) and dairy forms with healthier polyunsaturated and monounsaturated fats such as olive oil.

Canola oil - in particular omega-3 enriched canola oil - has been associated with benefits including decreased risk of cardiovascular disease, reduced belly fat and improvement in metabolic syndrome. Metabolic syndrome is a combination of abdominal obesity, high blood pressure, abnormal cholesterol and high blood sugar. *News Medical* reported on the results obtained by scientists at the University of Granada, the CIDAF, and the Richardson Centre for Functional Foods and Nutraceuticals at Canada in November 2016, in which it was found that consuming high-oleic canola oil enriched with omega-3 significantly reduces the concentration of triglycerides in the blood and reduces the risk of cardiovascular disease.

Around the same time, researches from the University of Manitoba Canada, Laval University Canada and Penn State University USA, announced findings that suggest canola and high-oleic canola oil can help decrease abdominal fat, which in turn may

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improve metabolic syndrome. In the trial, conducted with 101 participants with central obesity and at least one additional risk factor for metabolic syndrome, researchers saw a significant decrease in the abdominal fat mass in participants who consumed canola and high-oleic canola oil as part of the study. A decrease in blood pressure was also observed.

Canola oil has the least saturated fat of any oil, the most plant-based omega-3 fat and contains mostly monounsaturated fat. The researchers say the use of oil containing mostly MUFAs, “could help to have a significant impact on public health”.

### **Vitamins in oil**

Vitamins are understood to be necessary compounds that the human body needs for growth and to function. These cannot be produced by the body and must be obtained from food. Although it can be agreed that vitamin intake is essential for health, the various specific claims of what each vitamin can do beyond normal health and body function is questionable.

The vitamin content of different oils varies and although claims have been made of the positive effects of specific vitamin consumption, trials and research often fail to find consistent correlations.

Palm oil, soyabean and sunflower oils are reported to be high in Vitamin E, which some claim acts as an antioxidant, aids eye health and neurological functions.

Anything that contains antioxidants can inhibit the oxidation of other molecules. Oxidation creates free radicals, which leads to chain reactions that damage cells. These chain reactions are terminated by antioxidants.

The US Department of Health & Human Services Office of Dietary Supplements’ fact sheet on Vitamin E considers these claims. It concludes that the available evidence on vitamin E’s involvement in eye health is inconsistent, in particular with regards to whether it can reduce the risk of a person developing age-related macular degeneration (AMD) or cataracts, although some research shows it can slow the progression of advanced AMD in some cases.

In regards to neurological functions, it is equally as negative, with research concluding that Vitamin E supplements do not support the maintenance of cognitive performance or slow its decline with normal aging.

It also debunks the myths that Vitamin E is useful in preventing cancer or preventing cardiovascular disease in middle-aged or elderly individuals.



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It appears, therefore, that claims of vitamin content in various vegetable oils and fats mostly do not correlate with any real evidence proving health benefits.

Palm oil is also high in beta-carotene, which is a precursor, or inactive form, of vitamin A. A review in the *Journal of American College of Nutrition* found that palm oil could be used to treat Vitamin A deficiency.

### **Cholesterol: what is it? Good vs bad**

In a study of edible oil and its relative healthiness and health benefits, cholesterol must be discussed. According to charity Heart UK, cholesterol is a waxy substance that is produced in the body but is also present in some foods. Cholesterol is important for bodily function and is vital for every cell to work. It is also needed to produce Vitamin D, some hormones and digestive bile. Although necessary, too much cholesterol can increase the risk of developing heart and circulatory diseases, Heart UK says.

Cholesterol is carried in the blood by proteins; proteins containing cholesterol are called lipoproteins.

There are two types of lipoprotein:

- High-density lipoprotein (HDL) – this carries the cholesterol from the cells back to the liver to be broken down or expelled from the body as waste. It is known as ‘good cholesterol’ and high levels are acceptable.
- Low-density lipoprotein (LDL) – this carries cholesterol to the cells that need it. If too much cholesterol is being carried, it can build up in artery walls and lead to health complications. It is known as ‘bad cholesterol’.

Heart UK lists foods high in bad cholesterol as including butter, hard margarines, lard, goose fat, coconut and palm oils - this is due to their high saturated fat content. The charity says that eating too much saturated fat will increase the levels of bad cholesterol in the blood. Replacing saturated fats with unsaturated fats can lower cholesterol levels again.

**TABLE 2 : ENERGY & SFA CONTENT OF OILS**

Oil	Calories per tbsp	Saturated fat (g)
Sunflower	120	1.8
Palm	120	6.7
Canola	124	1
Maize/corn	122	2
Peanut	119	2.3
Olive	120	–
Extra virgin olive oil	119	2
Coconut	117	11.8
Butter	102	7.3
Margarine	102	2.5
Palm Kernel	116	11
Soyabean	120	2

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According to the *LFRA Oils & Fats Handbook Series, Volume 1, Vegetable Oils and Fats*, studies have demonstrated that MUFAs can lower total and LDL cholesterol independently, although they have little impact on HDL. PUFAs on the other hand have been shown to reduce HDL cholesterol. Therefore, fast high in monounsaturated fatty acids, which help to lower the levels of LDL, would be recommended for those suffering from high cholesterol, or health conditions associated with high cholesterol. Oils high is PUFAs but low in SFAs include olive oil and rapeseed oil.

No focus on cholesterol would be complete without a look at *trans* fatty acids (TFAs).

TFAs are part of the unsaturated fatty acids within an edible oil or fat. Each of the double bonds within the unsaturated fatty acids can exist in the *cis* or *trans* geometric form.

Almost all double bonds in unsaturated fatty acids occur in the *cis* form, with the exception of fats from ruminant animals such as cows and sheep. Therefore, low levels of TEAs are found in milk and dairy products, and also in tallow.

In modern times, the biggest source of TFAs in foods is the use of partial hydrogenation to raise the melting point of oils and fats, in which the natural *cis* form of the double bonds are largely transformed into the artificial *trans* form.

TFAs have been found to have a double-negative effect on the balance of HDL and LDL. Not only do high levels of TFAs in the diet increase amounts of the bad LDL, they also lend to a reduction of the good HDL - this has been labelled the 'double whammy' of TFAs.

The negative effects of TFAs have not been linked to dairy fats.

It is the use of industrially-produced TFAs in food which is either banned, declared unsafe or subjected to specified limits in countries worldwide. See 'The trans fatty acid comundrum', OFI July/August 2015 for more information.

TABLE 3 : CHOLESTEROL CONTENT OF OILS	
Oil	Range (mean) mg/kg
Safflower	6-10 (10)
Sunflower	10-40 (17)
Maize/Corn	20-100 (50)
Groundnut	10-40 (30)
Cotton	20-100 (43)
Rapeseed	25-85 (50)
Olive	1-24 (7)
Palm	12-27 (19)
Soya	20-35 (28)
Fish oil	2,000-6,000
Dairy butter	2,200-6,800
Beef tallow	1,000-1,200

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## How heat changes oil

Up until this point, this feature has looked at the health benefits and analysed the healthiness of various vegetable oils as stand alone, room temperature oils. Although this has been revealing, the healthiness of vegetable oils and fats has been shown to change dramatically when they are heated, during the process of food cooking for example.

Importantly, when heating an oil or fat to a high temperature (cooking usually heats oil to around 180°C), the molecular structure of the oil and fat changes due to oxidation. This also happens to oil at room temperature, although much more slowly. Oxidation is a reaction between oil and oxygen and causes aldehydes and lipid peroxides to be formed. According to the BBC, even small amounts of aldehydes have been linked to increased risk of heart disease and cancer.

A BBC Magazine article in July 2015 asked the question, '*Which oils are best to cook with?*' and analysed how the heating of oil affects its properties. For the research, a number of residents of Leicester were given a variety of oils and fats to use in their everyday cooking. They were also asked to collect any used cooking oil (UCO) to be analysed.

Oils used in the experiment were sunflower oil, mixed vegetable oil, corn oil, cold pressed rapeseed oil, olive oil (refined and extra virgin) butter and goose fat.

Samples of the UCO were sent to Leicester School of Pharmacy at De Montfort University in Leicester for analysis. Professor Martin Grootveld and his team ran a parallel experiment in which they heated up these oils to frying temperatures.

According to the BBC report, the study in Leicester found that oils high in PUFAs (corn oil and sunflower oil) generated very high levels of aldehydes.

"It's a simple chemical fact that something which is thought to be healthy for us is converted into something very unhealthy at standard frying temperatures", Grootveld says.

In comparison, oils richer in MUFAs and SFAs, including olive oil, cold-pressed rapeseed oil, butter and goose fat, were much more stable and produced far fewer aldehydes. The study reported that saturated fats in particular barely underwent the oxidation reaction.

Fats rich in monounsaturated fats, such as lard, are preferable for frying than those rich in polyunsaturated such as sunflower oil and corn oil, the research found.

Specifically, the recommendation following the research is to fry or cook with an oil or fat high in monounsaturated or saturated lipids - more than 60% for one and more than 80%



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if the fat or oil contains both types. Pick an oil which is low in polyunsaturated, ideally less than 20%.

Grootveld recommends olive oil when frying and cooking, due to fewer toxic compounds being generated, and those generated being less toxic and threatening than those formed from heating other oils. Olive oil is 76% monounsaturated, 14% saturated and 10% polyunsaturated - making it more resistant to oxidation and far more stable. Finally, advice states that there is no distinction when frying or heating between extra virgin olive oil (EVOO) and olive oil, as antioxidants that are understood to be present in EVOO cannot protect against oxidation through heat anyway.

### **Processing & refining**

As well as the negative effects of oxidation arising from heating oils during cooking, the high heats that vegetable oils and fats are subjected to during the processing stage may also cause the safety and health benefits of some oils and fats to be compromised.

According to a European Food Safety Authority (EFSA) opinion in May last year, process contaminants that form during the refining of some vegetable oils at high temperatures of around 200°C raise potential health concerns for young consumers and those who consume a higher than average amount. The contaminants that form are known as glycidyl fatty acid esters (GE), 3-monochloropropane-1,2-diol or 3-chloropropane-1,2-diol (3-MCPD) and 2-monochloropropane-1,2-diol (2-MCPD) and their fatty acid esters.

The EFSA's Panel on Contaminants in the Food Chain (CONTAM) says there is sufficient evidence that glycidol (the parent compound of GE) is genotoxic and carcinogenic and recommends a tolerable daily intake of 0.8 micrograms/kg of body weight per day for 3-MCPD.

According to the EFSA, the highest levels of all the contaminants were found in palm oils and palm fats, with margarines, pastries and cakes the main sources of exposure.

### **Coconut oil: evaluating the claims**

Coconut oil has experienced a great deal of hype in recent years, with celebrity endorsements and research claiming it as a 'cure all'. Although fashionable, are these health claims really true?

For example, the Indian Coconut Journal claimed in June last year that coconut oil:

- Is high in antimicrobial activity;
- Is an anti-depressant and anti-stress products;

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- Improves insulin secretion in diabetic patients;
  - Lowers the risk of coronary heart disease;
  - Prevents blood pressure increase, in turn lowering risk of cardiovascular disease;
  - Promotes weight loss;
  - Has positive effect on bone health;
  - Has positive effects on liver health;
  - Has a positive effect on cognitive performance, in particular for those suffering from Alzheimer's.

According to Ellie Krieger, writing in the Washington Post in October 2016, coconut oil is not quite the miracle fat that it has been made out to be. Laurence Eyres, chairman of the Oils & Fats Specialist Group at the New Zealand Institute of Chemistry, was the lead researcher on a meta-analysis of coconut oil's health and science claims.

According to the study, coconut oil sits between butter and unsaturated plant oils in terms of how it affects cholesterol levels and heart health. It is 92% saturated fat, and raised LDL ('bad' cholesterol) - although less than butter, but more than unsaturated plant oils.

For cholesterol, coconut oil is problematic. It raises both good and bad cholesterol-which some claim neutralises the result. However, according to the meta-analysis, coconut oil raises small LDL particles, "that are worrisome because they are really atherogenic", and promote the formation of plaque in the arteries.

A particular purported benefit of coconut oil is that it is a source of medium-chain fatty acids (MCTs) - a type of fat that is processed, absorbed and metabolised more effectively than other types of fat. The rhetoric about MCTs is true, but there is a problem with linking coconut oil with MCTs. According to Eyres, lauric acid (the predominant fatty acid in coconut oil) is often described as a medium-chain fatty acid, when in fact it behaves like a normal long-chain fatty acid in the body and coconut oil contains closer to 3% MCT.

As the so-called 'medium-chain fatty acid' content of coconut oil has been shown to be no such thing, this calls into question a variety of other health claims made about the oil which stem from this supposed high MCT content. For example, *SEA News Circular* in July 2016 said the MCT's in coconut oil meant it did not contribute to fat accumulation or obesity, and promoted weight loss. In addition, the same article notes: "the ketone bodies generated from MCTs in coconut oil could help treat neurological disorders such as Alzheimer's disease". Again, with an estimated MCT content in coconut oil of less than 3%, it cannot be said that this makes coconut oil ideal for treating Alzheimer's.

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Finally, the Washington Post report debunks one final myth around coconut oil and saturated fat in general - that it does not necessarily contribute to heart disease. According to the article, “even if saturated fat turns out to be neutral when it comes to heart disease, unsaturated fats, especially antioxidant-rich oils such as olive oil, are actually protective, so there is good reason to make them your go-to fats.” Citing studies of the traditional diets of Pacific Islanders, who historically consume a large amount of saturated fat from coconut products and have low rates of cardiovascular disease is also not a helpful claim. This is because the saturated fat in this instance is obtained from coconut products such as flesh, cream and flour, which is rich in fibre. Coconut oil, which contains no fibre and is not a traditional part of the diet for Pacific Islanders, and cannot claim the same low rates of cardiovascular disease.

Eyres says specifically, “It would be dangerous, and rather silly, to replace your extra-virgin olive oil with coconut oil”, for these reasons.

### **Olive Oil**

The advice from Professor Grootveld in the *BBC Magazine* feature was to cook with olive oil, but what other health benefits is olive oil claimed to have, and what is the evidence behind these claims.

In a special report, *Olive Oil Times* collected together the various health claims associated with the consumption of olive oil, some of which include:

- Effective against cancer: *Olive Oil Times* reports that olive oil contains the phytonutrient oleocanthal, which mimics the effect of the drug ibuprofen, reducing inflammation and reportedly decreasing breast cancer risk and recurrence. It is also purported that olive oil is protective against the development of breast cancer - studies show low incidences of specific types of cancer, including breast cancer, in individuals who moderately and regularly intake EVOO.
- Reduces risk of type 2 diabetes: the report says that a diet rich in monounsaturated fats (found in olive oil) has been shown in studies to protect from chronic diseases such as heart disease, cancer and diabetes. *Olive Oil Times* refers to a study published in scientific journal *Diabetes Care*, which showed an olive oil rich diet reduced the risk of a developing type 2 diabetes by almost 50% compared to a low fat diet.
- Might help prevent strokes: Researchers published a study in French online journal *Neurology*, where it monitored the number of strokes in 7,625 individuals over 65 in three French cities. The individuals had been categorised into three groups based

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on their levels of olive oil consumption (specifically, usually EVOO). After five years there had been 148 strokes overall. Analysis of the results showed that the group that most intensively used olive oil (for cooking and dressings) were 41% less likely to suffer a stroke in comparison to those who did not consume the oil at all.

- Fights against osteoporosis: Osteoporosis causes a decrease in bone mass, causing fragility of the bone and increases the possibility of fractures. *Olive Oil Times* reported that scientists found consumption of olive oil positively affected the thickness of bones, and scientists concluded, “it is a very promising candidate for future treatments of the disease”.
- Reduces the risk of metabolic syndrome: The risk of metabolic syndrome has been shown to be reduced by a Mediterranean-style diet including olive oil.
- Reduce the risk of Alzheimer’s disease: A study published in the journal *Chemical Neuroscience*, showed that oleocanthal present in EVOO has the potential to reduce the risk of Alzheimer’s disease, *Olive Oil Times* reported. It is also claimed it can reduce cognitive decline that occurs during aging.

### **Which oil wins the debate?**

The question of which oil is the healthiest to consume is by no means a simple one, and attempting to answer it leads one down many alternatives routes with multiple considerations.

However, at the end of most research routes, scientists and dieticians are coming to the same one oil - this is olive oil. Rich in mono and polyunsaturated fatty acids and low in saturated fats - both at room temperature and after being subjected to high heat - olive oil is stable and causes the occurrence of the least amount of toxic substances while at the same time being purported by multiple studies to reduce, protect against and prevent a variety of chronic diseases and age related decline - both of the body and the brain.

The views expressed in the ARTICLE is by the AUTHOR and the “Editor” does not necessarily concur with the views of the Author/Editor.

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## PARLIAMENT NEWS

Rajya Sabha Unstarred Question No. 4032 Answered on 07.04.2017

### LACK OF POST HARVEST INFRASTRUCTURE

Shri Anubhav Mohanty

- (a) whether it is a fact that due to inadequate post harvest infrastructure, a loss of Rs. 40,000 crore is being incurred annually;
- (b) if so, the additional measures the Ministry would take to further develop the post harvest infrastructure to minimize the losses incurred on an annual basis; and
- (c) whether the Ministry would consider a Public Private Partnership (PPP) venture to develop the post harvest infrastructure to take care of the losses?

#### **Answer**

Minister of State in the Ministry of Agriculture and Farmers Welfare

Shri Parshottam Rupala

- (a): The post-harvest losses have been assessed for 46 crops & commodities. The various stages which were considered for assessment of post-harvest losses are harvesting, collection, threshing, grading/sorting, winnowing/clearing, drying, packaging, transportation and storage depending upon the commodity. The post-harvest losses were observed to be in the range of 3.08-15.880%. The estimated monetary value of this loss was worked out to be Rs. 92,600 crore per annum (on the basis of prices during the year 2014).
- (b): Indian Council of Agricultural Research (ICAR) has developed equipment and process protocol for processing and value addition.

Under the sub-scheme Agriculture Marketing Infrastructure (AMI) of Integrated Scheme for Agricultural Marketing (ISAM), financial assistance @ 33.33% to the projects of North Eastern (NE) states, Sikkim, Union Territories (UTs) of Andaman & Nicobar Island and Lakshadweep Island, Hilly areas, Registered FPOs, Panchayats, Women, Scheduled Caste (SC) / Scheduled Tribe (ST) of their cooperatives / Self Help Groups and @25% to project for all other categories of promoters and given as per guidelines of the scheme and availability of funds.

Mission for integrated Development of Horticulture (MIDH) scheme provides assistance for post harvest infrastructure (PHM) including establishment of cold storages, processing units, pack houses, pre-cooling units, controlled atmosphere

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storage, reefer vans, Integrated Cold chain and setting up of ripening chambers. Under Post harvest component credit linked back ended subsidy @35% to @50% of the project cost is available. The component is demand driven and is available to individuals, group of farmers / growers / consumers, partnership/proprietary firms, self help groups, Farmer Producer Organizations (FPOs), companies, corporations, cooperatives, cooperative marketing federations, agricultural produce market committees (APMCs) & marketing boards, state governments and local bodies like Panchayats.

Furthermore, at places identified by Food Corporation of India (FCI) for construction of warehouses, private parties are awarded contracts on the basis of competitive bidding to construct the warehouses which are then hired by FCI for 10 years with guaranteed payment of storage charges.

- (c): The storage capacities in the country are augmented by the Government in Public Private Partnership (PPP) mode under Private Entrepreneurs Guarantee (PEG) scheme, where the godowns constructed by private parties/other agencies are dedicated for Food Corporation of India (FCI)/state agencies for 9 to 10 years for storage of foodgrains. Godowns are also constructed under Plan scheme specifically in the North Eastern States and a few other states. In addition, it has also been planned to construct steel silos of 100 LMT capacity in the country in a phased manner in PPP mode.

Rajya Sabha Unstarred Question No. 4035 Answered on 07.04.2017

### **MICRO IRRIGATION COVERAGE**

Shri Bhupender Yadav

- (a) the different types and estimated potential of micro-irrigation (MI) in the country;
- (b) the current coverage area of MI in the country and the States which perform the best; and
- (c) the steps being taken by Government to increase the MI coverage, equipment production and investments in this regard?

#### **Answer**

Minister of State in the Ministry of Agriculture and Farmers Welfare

Shri Parshottam Rupala

- (a): Micro Irrigation (MI) broadly includes Drip & Sprinkler Irrigation systems. As per the



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report of National Task Force (2004) on Micro Irrigation, there is a potential of coverage of about 69.0 Million Hectares under Micro Irrigation in the country.

- (b): As per available reports, so far about 5.9 million ha. has been covered in the country under Micro Irrigation through funding from Centrally Sponsored Scheme. The performance of the programme is comparatively better in the States like Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu, Telangana etc.
- (c): Micro irrigation has been getting enhanced allocation over last few years. This year also much higher budgetary provision has been made as compared to last year. Besides, State Governments are being frequently advised to promote Micro Irrigation. Capacity building and awareness programmes are being made to encourage farmers to adopt MI. To ensure large adoption of MI system in the poorly penetrated States, farmers are supported with higher subsidy compared to other States. Further, higher funding pattern of 90:10 between Central and State Governments is for North Eastern and Hilly States to encourage higher coverage, where as 60:40 funding pattern is applicable for other States.

Rajya Sabha Unstarred Question No. 4017 Answered on 07.04.2017

### **POLICY CHANGES IN FOOD AND AGRICULTURAL SYSTEM**

Shri Darshan Singh Yadav

- (a) whether Government is contemplating policy changes as food sovereignty concerns people's right to health and culturally appropriate food produced with ecologically sound and sustainable methods and their right to define their own food and agricultural system; and
- (b) if not, the barriers to formulate such progressive and people focused policy?

#### **Answer**

Minister of State in the Ministry of Agriculture and Farmers Welfare

Shri Parshottam Rupala

- (a) & (b) : The Government has in the recent past shifted its approach from production centric to farmer centric. Towards this direction, Hon'ble Prime Minister has set a target to double the farmers' income by 2022, for which a Committee has been constituted under the Chairmanship of Additional Secretary, Department of Agriculture, Cooperation and Farmers Welfare.

Apart from the above, the strategy of the Government is to focus on farmers' welfare by making farming viable. Farm viability is possible, when cost of cultivation is

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reduced, yields per unit of farm are increased and farmers get remunerative prices on their produce. To this end, Department is implementing various schemes to meet this objective, viz.

- (i) Soil Health Card (SHC) scheme by which the farmers can know the major and minor nutrients available in their soils which will ensure judicious use of fertiliser application and thus save money of farmers. The balanced use of fertiliser will also enhance productivity and ensure higher returns to the farmers.
- (ii) Neem Coated Urea which is being promoted to regulate urea use, enhance its availability to the crop and reduce cost of fertilizer application. The entire quantity of domestically manufactured urea and imported urea is now neem coated.
- (iii) Paramparagat Krishi Vikas Yojana (PKVY) is being implemented with a view of promote organic farming in the country. This will improve soil health and organic matter content and increase net income of the farmer so as to realise premium prices.
- (iv) The Pradhan Mantri Krishi Sinchai Yojana (PMKSY) is being implemented to expand cultivated area with assured irrigation, reduce wastage of water and improve water use efficiency.
- (v) The National Agriculture Market scheme (e-NAM) envisages on boarding of at least 585 markets on a common e-platform which would help the farmer to get better prices for this produce.
- (vi) The Pradhan Mantri Fasal Bima Yojana (PMFBY) is being implemented from Kharif 2016 season. This scheme addresses all shortcomings of in the earlier schemes and is available to the farmers at very low rates of premium. This scheme would provide insurance cover for all stages of the crop cycle including post-harvest risks, in specified instances.
- (vii) The Government provides interest subvention of 3% on short-term crop loans up to Rs. 3.00 lakh. Presently, loan is available to farmers at an interest rate of 7% per annum, which gets reduced to 4% on prompt repayment. Further, under Interest Subvention Scheme 2015-16, in order to provide relief to the farmers on occurrence of natural calamities, the interest subvention of 2% shall continue to be available to banks for the first year on the restructured amount. The benchmark for initiating relief measures by banks has also been reduced to 33% crop loss in line with the National Disaster Management Framework.



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In addition, the Government is implementing several Centrally Sponsored Schemes viz. National Food Security Mission (NFSM); Mission for Integrated Development of Horticulture (MIDH); National Mission on Oilseeds & Oilpalm (NMOOP); National Mission for Sustainable Agriculture (NMSA); National Mission on Agricultural Extension & Technology (NMAET) and Rashtriya Krishi Vikas Yojana (RKVY).

MPS is also notified for both Kharif & Rabi crops based on the recommendations of the Commission of Agriculture Costs & Prices (CACP). The Commission collects & analyses data on cost of cultivation and recommends Minimum Support Price (MSP).

Further the Government undertakes procurement of wheat and paddy under its 'MSP operations'. In addition, Government implements Market Intervention Scheme (MIS) for procurement of agricultural and horticultural commodities not covered under the Minimum Price Support Scheme on the request of State/UT Government. The MIS is implemented in order to protect the growers on these commodities from making distress sale in the event of bumper crop when the prices tend to fall below the economic level/cost on production.

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## **A REVIEW**

*The book entitled “A treatise on Analysis of Food, Fats and Oils” is an example of unique competence and contribution of the authors, S. K. Roy, N. K. Pramanik and A. R. Sen.*

*The book is the first of its kind in India. It covers the traditional and modern analytical methods for the characterization and quality of fats, oils as well as other food items.*

*The authors are well reputed and qualified and they have applied their collective wisdom and expertise in including and presenting more appropriately and meticulously the analytical methods.*

*The book can also be viewed as a rarer type as it deals with the statutory and industrial aspects of fats, oils and their products, and pollution control in vegetable oil industry.*

*In fact these aspects are of extreme use and importance to those concerned with these issues.*

*The book is already well received by the readers and users in the academic and industrial circles throughout India because of the highly relevant and beneficial methodologies and basic-cum technological information. The book will be recognised in due course of time as one of the top quality analytical books in the area of food, fats and oils.*

***Prof. D. K. Bhattacharyya***

**21-6-2003**

Regarding availability/price enquiries may be made to :  
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## BOOK REVIEW

A book entitled “Perfumery Materials, Production and Applications” has been authored by an very eminent Professor (Dr) D. K. Bhattacharyya, Emeritus Fellow (AICTE), Adjunct Professor Bengal Engineering and Science University, former President, O.T.A.I and a Scientist of National and International repute.

The book speaks for itself about his mastery and competence in the discipline of “Perfumery Materials”.

“The book demonstrates the scopes of certain specific reactions and raw materials in producing new synthetics. The enormous scopes of biotechnology involving bio-conversion processes’, with isolated enzymes and by fermentation biotechnology involving selective microorganisms has been indicated in making synthetics. The applications of natural aromatic oils in aromatherapy, food, cosmetics/toiletries, imitation perfumery and allied sector have been included.

Standardisation and evaluation of natural aromatic (essential oils and incidence of their adulteration have been elaborated in order to ascertain their quality and authenticity for sustaining the business in the industry” says Prof (Dr) R.N. Mukherjee, Former, Professor and Head, Deptt of Chemical Engg, University of Jadavpur. The book will fulfill a long felt want in the discipline of Essential Oils and will cater to the various categories of Scholars, Scientists and Technologists. The book has already been well appreciated in India and abroad, though published by the Stadium Press L.L.C., USA.

Those interested to procure a copy of this Valued book on Essential Oils may contact Professor D. K. Bhattacharyya at Phone No (033) 2461 9662.

(S. K. Roy)  
Editor



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