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Oil Technologists' Association of India (North Zone)

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Editor's desk.....

Plants and especially oilseeds are presently the primary source of oils and fats, and are expected to continue domination of the global market in the future. The product demands, however, will dictate either modification of existing plant oils or the introduction of novel crops. Every consideration will need to be given to plant germplasm, genetics, and biochemistry.

In addition, adoption of the newer techniques of genetic engineering and molecular biology coupled with fundamental breeding practices can be expected to allow the development of cultivars capable of producing a variety of desired products.

Thus, it has been suggested that the general application of biotechnology should permit improvements in the nutritional quality of two-thirds of the present plant based edible oil production. An increased consumer demand for these "designer oils" or physiologically functional food can be fully anticipated.

Oils containing higher amounts of medium - chain length or long - chain polyunsaturated fatty acids (like fish oil) along with polyphenolic compounds (micro- nutrients) are suitable as special dietetic oils or as nutraceuticals. New tailor- made (designer) oils may be a new series of vegetable oils suitable for edible purposes, where conventional oils are not suitable.

The designer oils and fats will be able to make available many desired qualities for food preparation, confectionary and bakery products. They will also help in realising new dimensions in physical appearance, texture, taste and flavour. With designer oils and fats, many issues related to health, supply of oil based micronutrients and pharmaceutical domains will be resolved.

Yours truly
C.S. Joshi
Editor

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(North Zone)

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Vegetable Oils: The Conversions of Research, Innovations, Quality and Food Safety

By D. Mathur
President-OTAI

The Indian edible oil market is expected to grow significantly during next five years. It is due to the rising preferences for unprocessed, unrefined, and healthy oil. Consumers are more concerned about their health and wellness as they are increasingly choosing high-quality edible oils. The rising prevalence of lifestyle-related diseases such as diabetes, high cholesterol, and hypertension drives premium or value-added edible oil such as canola oil, olive oil, and rice bran oil. Further, the increasing population base and growing economy will augment the Indian edible oil industry's growth.

Urbanization & Evolving Eating Routines

Change in Indian eating habits is a major factor that will drive the demand of edible oils in the near future. Indian population has adopted the concept of convenience foods and is also increasing stepping out of homes for sourcing their meals. The growing

trend of 'eating out' and high consumption of convenience foods will equate to higher oil consumption which will be palpable in the consumption numbers of edible oils in India.

Growing Preference for 'Healthy Oils'

The growing popularity of low calorie content oils is one of the market factors for India's edible oil industry. Indian consumer becomes more health-conscious and they stared preferring edible oil with low cholesterol content such as canola oil, olive oil, and rice bran oil in order to prevent the high risk of coronary heart disease, brain stroke and type-2 diabetes, associated with the trans-fat consumption. To capitalize on the increasing need for "balanced oils," all of the big oil companies have launched healthier versions of their standard offerings. Since they are pressed at a lower temperature, cold-pressed oils are considered high-quality oils because the oil's taste and characteristics are preserved, which is likely to fuel the market.The demand for organic produce and organic and cold-pressed oils and fats skyrocketed in the last two years.The increased awareness of eating healthy has led to tremendous market demand for healthy, organic, unprocessed and non-refined oil.

At the same time, the last few years in the edible oil industry has exponentially increased the production of soy, canola, and sunflower oils due to factors like their shelf life, high smoke points, and health profile without any compromise. While the demand for edible oils & fats is enormous, the profit margin for the edible oil & fats manufacturers is not very high. Oil cakes and by-products can be fodder for livestock, raw materials in cosmetics production, and lubrication for heavy machinery. Let us look at a few innovative ways the residue of oil and oil cakes can generate profits when you use the right machinery.

Biodiesels

Biodiesel derives from animal fats, non-edible vegetable oils, and by-products of oil & fats; it is a renewable fuel. Biodiesel can be used both in its pure form or by blending it with conventional diesel for automotive / heating purposes.. While Biodiesel is slowly rising to fame, many companies are yet to use the by-products and convert them into renewable fuel.

Lecithins

Sunflower seeds and soybeans are a significant source of derivation for Lecithins. Corn and animal fats are also a few other options of derivation. Cosmetics, medication, and other food preparations use Lecithins since it helps extend the shelf life. Lecithin acts as an emulsifier in a wide range of food.

While Lecithin has been around, its importance and usage have gained fame over the past few years.

Oleochemicals

Vegetable oils/ fats go through a lengthy splitting, purification, and reaction process. While the process itself is long, it has proven lucrative due to its application in cosmetics, chemical industries, and lubricants. Oleochemical derivatives are in great demand for emulsifier surfactants and work as additives to improve polymer characteristics. The oils and fats manufacturing companies are on the verge of realising the value of Oleochemicals and their marketability. However, the next few years will see a tremendous change in this area, considering this is quite a lucrative opportunity that has remained unexplored over the years.

Rice bran oil - the emerging winner

The cooling and lubrication of lathes and other cutting machinery require many petroleum-based oils, which have an adverse effect. The mineral oils used regularly have been linked to cancer and proven to be causing harmful effects with prolonged usage. The recent research on the usage of rice bran oil in

the cooling and lubrication process has proven to be a greener option compared to the commercial cutting fluid. Furthermore, the performance of the machinery seems to be much better with the "green" oil use. The rice bran oil usage in cooking has seen a significant increase over the past few years, and its other applications are sure to cause a spike in its production shortly.

Challenges in the processing of edible oil and fats

Edible oil and fats extraction processing poses numerous challenges, from procuring raw materials to making the end product available to the consumer

1. Adherence to FASSI/BIS rules.
2. Raw material purchasing
3. Seasonal availability of raw materials
4. Adherence to commercial terms
5. Monitoring and control of oil contaminations
6. Oil storage conditions
7. Customs and other transportation criteria

Therefore, finding innovative ways to retain edible protein, protect human health, and do all of it cost-efficiently through sustainable processing methods is quite a challenge.

Food enthusiasts across the globe have opened up their doors to food from various cultures. It has led to a tremendous increase in healthier food options, mainly oils and fats. From culinary purposes to industrial use, the oil & fats industry is on a boom that we have never seen before. Manufacturing companies have realised the need to opt for greener instead of heavy chemical choices. From organic oils to cold-pressed oils, utilising by-products for industrial purposes to their utilisation in cosmetic and medical space, the oils and fats industry has been going through innovation at a much faster pace than the past decade.

Global greenhouse gas emissions account for up to 15%, leading to climate change. While there are numerous challenges, offering training to farmers, providing them with better seeds, and technological innovation in the oilseed processing industry are a few ways that help to overcome them. It can bring about a sea of change and enable manufacturers to meet the growing demand.

Structured Edible Oil:

Saturated and trans (produced during partial hydrogenation of unsaturated oils) fatty acids in food are related to several comorbidities and mainly to the raise in blood cholesterol levels, which in turn is a risk factor for cardiovascular disease (CVD), and as such, hydrogenated fats have become one of the biggest health issues around processed foods in recent years. Not only does this contribute to increased morbidity but is also a major economic cost for national healthcare providers and governments.

Manufacturers have tried introducing reduced calorie foods, where fats (or carbohydrates) have been removed and replaced with other ingredients to lower the energy density. Take up of these has been low, however, as their taste and texture are often considered inferior by the consumer, have pointed out that even the smallest change to texture and flavor of a food product can disenfranchise the consumer base, which is no incentive for manufacturers to reformulate their products. Clearly, if current strategies for fat replacement or low energy density foods production are not producing products of sufficient quality, then other strategies for the formulation of healthier foods should be researched. The challenges are mainly related to the physicochemical properties of fats and their influence on food structure and organoleptic properties. Therefore, the scientific community and the industry are looking for new ways to structure oils and replace the existing fats by healthier fats and obtain reduced low-fat content products while

maintaining the organoleptic properties and convenience of the products, ensuring acceptance by consumers.

Structured fats are focused on ways to structure polyunsaturated edible oils (so-called oleogelation) so they can be used in place of their saturated counterparts. A range of oleogelation mechanisms are explored. They have taken the use of hydrocolloids a step further and demonstrate that use chitosan in combination with anionic polysaccharides to replace 80% of the cocoa butter in dark chocolate with oleogelled oils. New network gel in the oil, with the structure and properties making them well-suited to encapsulation of bioactive ingredients in functional foods. Recently a very interesting study on oleofoams, oil systems where air bubble are trapped in an oleogelled network have been reported. Oleogel technology has evolved a wide range of intermediate and high-water activity foods, including food emulsions.

A team of scientists has developed a method to effectively produce and extract plant-based oils from a type of common microalgae.

As the oils produced from the microalgae are edible and have superior properties to those found in palm oil, the newly discovered method would serve as a healthier and greener alternative to palm oil. Compared to palm oil, the oil derived from the microalgae contains more polyunsaturated fatty acids, which can help reduce 'bad' cholesterol levels in blood and lower a person's risk of heart disease and stroke, the study states. The algae oil innovation could present a possible alternative to several health challenges by consumption of vegetable oils.

The scientists say that when scaled up, the production of the plant-based oils with natural sunlight, instead of using ultraviolet lights, would help remove carbon dioxide from the atmosphere by converting it to biomass and oxygen via photosynthesis. As the microalgae grows, it changes carbon dioxide to biomass at relatively fast rates.

Edible oils – minimising contaminants to improve quality

Consumers are becoming more health conscious when it comes to oils and fats, perhaps due to increased awareness from conferences, research and media outlets focusing on the impact of fats and oils. The result is that the edible oil industry, specifically refineries, is having to join the discussion and even change their processing techniques in order to improve the oil quality and minimise the various contaminants that are being produced during the refining process.

One such contaminant is 3-monochloropropanediol – known as 3-MCPD. Several studies found elevated levels of 3-MCPD and glycidyl fatty acid esters (GE) in a wide variety of retail processed foods such as, cereals, biscuits, crackers, doughnuts, breads and infant formulas.However, refined oils contain the highest levels of 3-MCPD and GE. In refined oil these contaminants are produced during the refining process and are therefore referred to as "processed induced contaminants." The true mechanism of the formation of these contaminants is still an active topic of research for many in the edible oil industry.

However, the oil also contains around 3-5% of minor components such as free fatty acids (FFA), phosphatides (gums), monoacylglycerols (MAGs), diacylglycerols (DAGs), peroxides, tocotrienols, phytosterols, and many others. Due to the presence of these minor components the crude oil is subjected to chemical and physical refining processes before being consumed in various foods.

Food Safety and quality infrastructure

A recent survey's key findings are a continuing lack of ISO certified food safety testing laboratories (less than 25 percent in India certified to ISO 17025: 2017 compared to 100 percent in Europe); gaps in training programmes (most of the establishment had no active training programme) If this is to change for the better, significant and urgent investment is

needed in physical laboratory infrastructure as well as human capacity.

It has been observed that the percentage of accredited laboratories rose recently in the country for food testing labs they regularly participated in an ISO17043 accredited proficiency test schemes However, in other areas the situation had deteriorated significantly.

We need much more concerted action and investment on the part of the governments the continental and regional authorities and the development partner community,

The safety of food supplies is a matter of global concern today. In today's modern era, despite the latest technology, novel product forms, detection tools, safety certifications, regulations, compliance, monitoring, and consumer education on food safety, reports about outbreaks of foodborne illnesses have been on the rise. Safe food supplies support national economies, trade and tourism, contribute to food and nutrition security, and reinforce sustainable development.

Due to growing urbanisation, and altering consumer habits, there is an increase in the number of people preferring to buy and eat food prepared in public places. Better food safety and quality standards can be used to reduce wastage, in ways that are still safe for human consumption from the food supply chain.

A series of evolving "**challenges and risks"** could put the currently food safety system under severe stress. Some of these challenges include:

- **Increasing concentration of the supply chain:** Food safety challenges exist along each step of the supply chain from concept to commercialisation. An increase in population is important in terms of future food demand, as it relates to sufficient food production as well as food security.
- **Changing diet trends:** Increased consumer dependency on digital services or dietary choices
- **Price volatility:** Food choice is driven by price, taste and convenience
- **Climate change:** The food system is dynamic, constantly influenced and shaped by several factors such as environment, climatic conditions, global political and socio-economic situation, scientific and technological developments and consumers' demands and preferences.
- **Demographic imbalances:** Demographic characteristics of the Indian population such as household size and ageing levels can affect eating habits and dietary needs.
- **Decrease in agricultural productivity:** The extent to which modern technologies are taken up and applied by food chain also influences food production, in addition to the environmental and economic performance of the food chain.
- **Anti-microbial resistant emergence:** Animal and plant production systems develop microbial resistance to disease-transmitting pathogens, resulting in a decrease in food production and food quality.
- **Scarcity of energy and resources/ Depletion of natural resources:** The future extent of global trade liberalisation, including agriculture and food products, will affect the availability of resources and food products in Indian market and might impact the structure of the agro-food industry. quantity and quality of future food supply will be constrained by limits of its main inputs, including land, water, energy, and fertilisers.

Technological innovation can aim at various food and food-related aspects, including increasing productivity, increasing shelf life as well as reducing cost and optimisation. Consequently, modern technologies may provide answers for existing and emerging challenges in food safety. However, modern technologies may also include new risks for

food production.

Increased control and regulation have resulted in slower or inhibited innovation, but these are far outweighed by increased safety for consumers. All creativity, knowledge, entrepreneurial spirit and sustainable innovation pathways should be mobilised to guarantee availability and access to food for the coming generations.

Food safety challenges identified globally:

- Food related systems, certifications, and compliance should be adequate to have food product controls
- Umpteen sources of voluntary food information and increased opportunity for false information
- Lifestyle changes causes a rise in sedentary behaviour
- Food safety standard being not harmonised in the third countries, there is a lot of variation in food handling and compliance with food standards.
- Evolving biological risks and increased occurrence of antimicrobial resistance with appearance of new strains
- Safety challenges associated with processed and pre-packaged food
- Inadequate food safety and nutrition literacy, loss of food traditions and increased exposure to unreliable sources of information
- Risk of overconsumption of nutrients or other food ingredients
- Increased consumer dependency on digital services or dietary choices

As per the study, the top three food safety training challenges identified by the survey respondents were:

- Scheduling the time for training employees;
- Verifying the effectiveness of training, and
- Organising refresher training

It takes just one unfortunate food incident to cause irreparable damage to people, profits, and brands. Leading companies are tackling these safety training challenges with best practices including frequent but shorter training sessions, automated learnings or seminars, and providing visual aids, videos and training tools to supervisors so they can train and coach employees directly on the facility floor.

World Health Organization (WHO) key facts sheet on Food Safety

- Access to adequate quantities of safe and nutritious food is key to sustaining life and promoting good health
- Unhygienic food containing harmful bacteria, viruses, parasites or chemical substances, causes more than 200 diseases – ranging from diarrhoea to cancers
- An estimated 600 million – almost 1 in 10 people in the world – fall sick from consumption of contaminated food and 4,20,000 people die per year, resulting in the loss of 33 million healthy life years (DALYs)
- With 1,25,000 deaths every year, children under 5 are highly prone to foodborne diseases acting as vehicles for 40 per cent of those diseases
- Leading to sickness in 550 million people and 2,30,000 deaths every year, diarrhoeal diseases are most common, which result from consumption of contaminated food
- Food safety, nutrition, and food security are inseparably dependent. Unhygienic food forms a serious cycle of disease and malnutrition, especially in infants, young children, the elderly and the sick
- Socioeconomic development is delayed due to foodborne diseases, by straining health care systems, and harming national economies, tourism, and trade

- Food supply chains are now spread across the globe. Good collaboration between governments, manufacturers, and consumers helps, ensure food safety

WHO aims to facilitate global prevention, detection, and response to public health threats associated with unsafe food. Through this, it aims to achieve consumer trust in their authorities, and confidence in safe food supply. To do this, WHO helps the Member States build the capacity to prevent, detect and manage foodborne risks by:

- providing independent scientific assessments on microbiological and chemical hazards that form the basis for international food standards, guidelines, and recommendations, known as the Codex Alimentarius, to ensure food is safe wherever it originates
- assessing the safety of modern technologies used in food production, such as genetic modification and nanotechnology
- helping improve national food systems and legal frameworks and implement adequate infrastructure to manage food safety risks. The International Food Safety Authorities Network (INFOSAN) was developed by WHO and the UN Food and Agriculture Organization (FAO) to rapidly share information during food safety emergencies
- promoting safe food handling through systematic disease prevention and awareness programmes, through the WHO Five Keys to Safer Food message and training materials, and
- advocating for food safety as an important component of health security and for integrating food safety into national policies and programmes in line with the International Health Regulations (IHR – 2005)

WHO works closely with FAO, the World Organization for Animal Health (OIE) and other international organisations to ensure food safety along the entire food chain from production to consumption.

Conclusion

The food safety program appears to be robust and appropriate. However, certain elements need to be strengthened to better prepare for future challenges i.e. harmonisation and streamlining risk assessment approaches and inclusion of risk-benefit assessment, need for benchmarking system to monitor the performance of regulatory system related to food safety. Additionally, the high complexity and number of active compounds present in the foodstuffs, bear a high risk of adverse health effects due to cocktail effects. Therefore, to address the challenge of performing risk assessment related to cumulative effects, improvement, and expansion of existing in silico computational tools will be needed.

Addressing these food safety challenges will require investments in food safety certification and compliance, training, information technology (IT), end-to-end management of the supply chain and building food safety capability from the CEOs to the line operators.

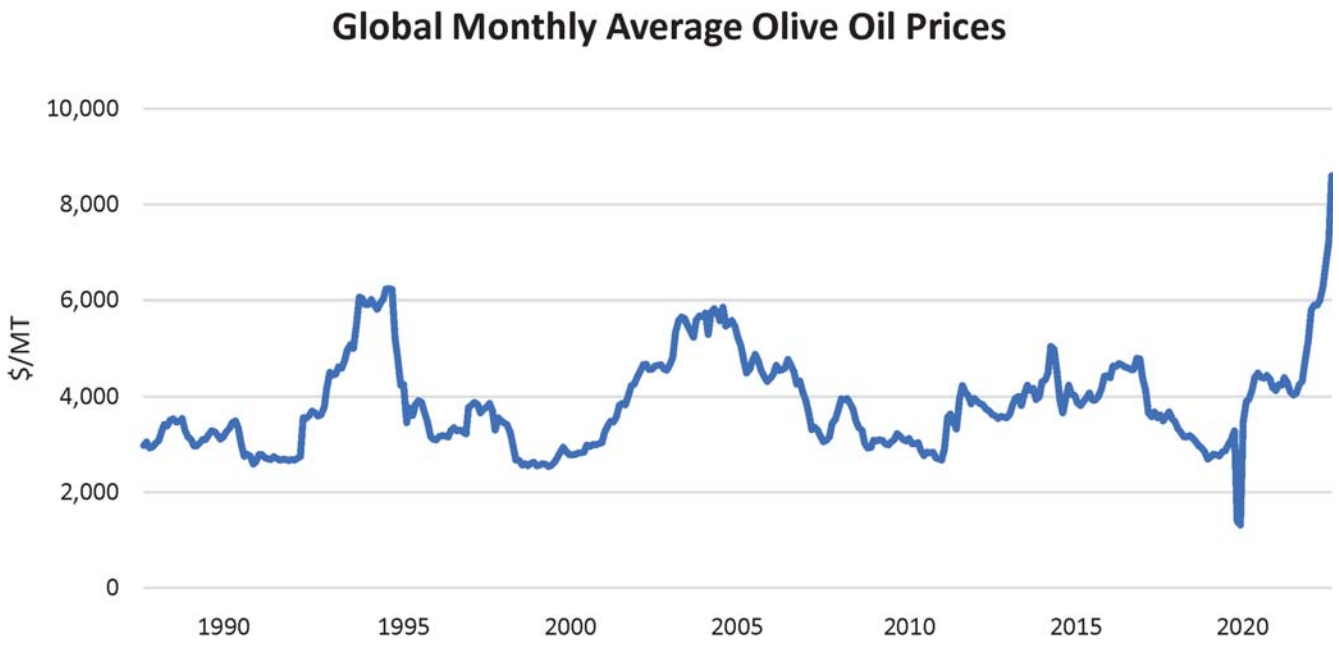
India's soybean production estimate for marketing year (MY) 2022/23 (October-September): is slightly lowered to 11.4 million metric tons (MMT) because of the impacts of the delayed and erratic 2022 monsoon. Cumulative edible oil imports in the October 2021 to June 2022 period have increased one percent to 10.l MMT, and crude palm oil remains the primary consumed oil. India's soybean oil imports are estimated to have reached 4.1 MMT in MY 2021/22, reflecting competitive market pricing, the Indian government's removal of the basic duty, and palm oil and sunflower seed oil supplies that were disrupted earlier this year. India's peanut production for MY 2022/23 is reduced to 6.5 MMT due to the erratic monsoon, and a reported shift of peanut acreage to cotton and other higher value crops.

Courtesy : oilseeds and products new Delhi (IN202-0077)

Olive Oil Prices Skyrocket on Low Supplies

Global olive oil prices topped $8,900/ton this month, driven by the realization of off-year growing cycles and extremely dry weather in much of the Mediterranean. The average price in August was 130 percent higher than the year before, with prices quickly surpassing the previous record of $6,242/ton set in 1996 with no sign of easing.

Prices have risen steadily since the extent of the damage to the harvest became apparent. However, more recent concerns over supplies in Spain (typically 45 percent of global exports) sent prices skyward as the market attempts to ration supplies towards the end of the marketing year. As a result, olive oil consumption is forecast flat or down in 2022/23 for every single country except Turkey, where the government recently banned bulk olive



Source: IMF Primary Commodity Prices

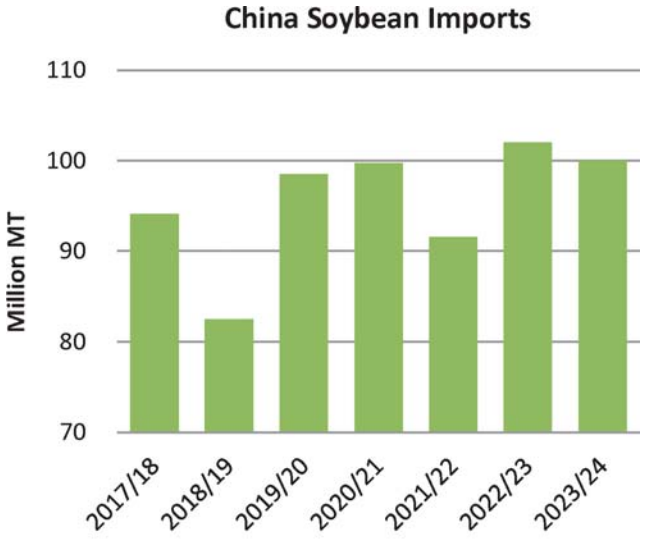
oil exports in an attempt to ensure domestic supplies and alleviate price pressure even with record domestic production. This month, UDSA revised 2022/23 global olive oil production down to 2.5 million tons, a quarter lower than both the previous year and the 5-year average. Concerns over production in 2023/24 are also exacerbating the price spike as hot and dry conditions develop in the Mediterranean once again. While prices have moderated consumption somewhat, consumer and cultural preferences for olive oil make it difficult to substitute despite plentiful supplies of other vegetable oils. While the intense price hike in the market will assist in further tempering demand this season, carryin to the next year will be scarce, especially in the EU (the largest olive oil producer, consumer, and exporter). This will keep prices elevated into 2023/24, especially if the next harvest is similarly impacted by poor conditions. More price-sensitive exporters in the Middle East and North Africa tend to reduce olive oil consumption in favor of the high prices offered on the export market. Less price-sensitive buyers, however, have proven that their preference for olive oil holds relatively more inelastic as prices have risen. For example, U.S. imports usually make up around 30 percent of global olive oil trade, but this year are slated to be 35 percent and 37 percent in 2023/24.

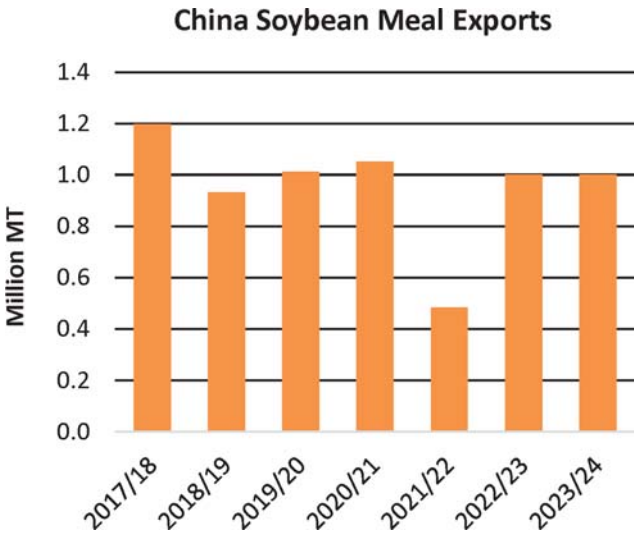
In large scale continuous plants the soybean oil circulates in the scrubbing system picking up not only free fatty acid but also tocopherol, sterols and some other substances. A temperature of around 50 deg C (122 deg F) is normal. There is a continuous discharge from the loop to maintain a constant volume and composition. The distillate will typically have the composition 1/3 free fatty acid, 1/3 neutral oil (tri and partial glycerides) and 1/3 unsaponifiable material, mainly tocopherols and sterols. You might not be operating at a sufficiently large scale make this worthwhile but tocopherols and sterols can be valuable by-products.

Courtesy: AOCS

2022/23 China Soybean Imports at Record High

This month, USDA raised 2022/23 China soybean imports (Oct-Sep) by 2.0 million tons to a new record of 102.0 million tons on strong end-of-year shipments, primarily from Brazil. Soybean crush is also raised to 93.0 million tons on improved domestic margins, stronger demand for feed and vegetable oils, and a recovery in meal exports in the last quarter of the marketing year. Soybean meal exports are raised this month by 200,000 tons to 1.0

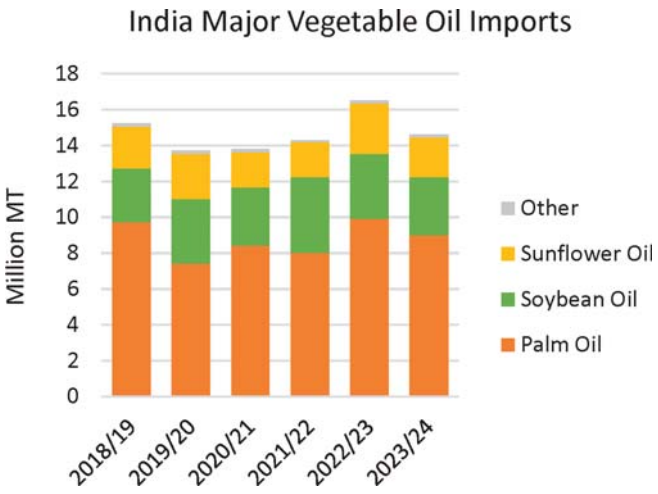


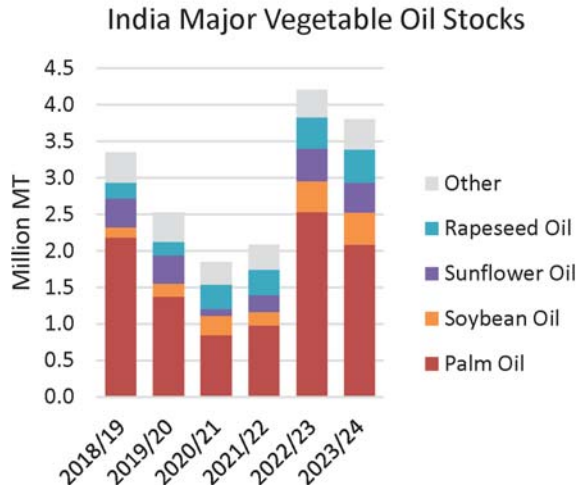


million on higher supplies and demand from neighbouring countries. In line with current marketing year changes, 2023/24 soybean imports and crush are each raised by 1.0 million tons, while soybean meal exports are lifted 500,000 tons.

India Vegetable Oil Imports Reach Record in 2022/23

India is estimated to import a record 16.5 million tons of vegetable oil, including nearly 10.0 million tons of palm oil. Additionally, imports of sunflower seed oil have reached unprecedented levels as large volumes of this premium oil are being offered at a discount from the Black Sea region. While consumption of vegetable oils has recovered this marketing year, recent large volumes of imported oils will also help replenish stocks in India and support growing demand during festivals in coming months. With unusually large oil inventories expected at the end of the current season, India imports in the new marketing year 2023/24 are projected to decline to 14.6 million tons. Larger carryin stocks will help alleviate any uncertainties about El Niño effects on domestic and Southeast Asia oil output. Ending stocks at the end of 2023/24 are projected to decline year over year due to higher consumption, but still remain





Source :-Foreign Agricultural Service/USDA

OUTLOOK FOR 2022/23

Global 2022/23 oilseed production is forecast at 630.0 million tons, up from August on higher India soybean, Pakistan rapeseed, and Argentina sunflower seed crops outweighing reductions to Canada rapeseed and Uruguay sunflower seed. Oilseed exports are up on Brazil soybeans and Canada rapeseed. China soybean imports are up 2.0 million tons with lower EU, Thailand, Pakistan, and Iran imports partially offsetting. Oilseed stocks are little changed overall with increases to China soybeans and rapeseed, India soybeans, and Canada rapeseed offsetting reductions to Ukraine sunflower seed and Brazil soybeans. Global vegetable oil trade is up on increases to Ukraine sunflower seed oil and Indonesia palm oil. The projected U.S. season-average farm price for soybeans is unchanged at $14.20 per bushel.

IMPORTANT FIGURES

Table 1: India: Oilseed, Soybean, Production, Supply and Distribution

Oilseed, Soybean Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Area Planted (1000 HA)	12700	12700	12700	12700	13000	13100
Area Harvested (1000 HA)	12147	12500	13000	13000	12500	12800
Beginning Stocks (1000 MT)	126	126	1509	1514	1337	1664
Production (1000 MT)	11889	11900	12038	12400	12000	11900
MY Imports (1000 MT)	555	555	600	650	400	600
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	12570	12581	14147	14564	13737	14164
MY Exports (1000 MT)	61	61	50	100	100	100
MY Exp. to EU (1000 MT)	1	1	0	15	0	0
Crush (1000 MT)	8500	8500	10200	10200	9900	9614
Food Use Dom. Cons. (1000 MT)	660	660	710	900	750	750
Feed Waste Dom. Cons. (1000 MT)	1840	1846	1850	1700	1850	1700
Total Dom. Cons. (1000 MT)	11000	11006	12760	12800	12500	12064
Ending Stocks (1000 MT)	1509	1514	1337	1664	1137	2000
Total Distribution (1000 MT)	12570	12581	14147	14564	13737	14164
(1000 HA), (1000 MT), (MT/HA)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 2: Oilseed, Rapeseed, Production, Supply and Distribution

Oilseed, Rapeseed Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Area Planted (1000 HA)	8300	8300	9000	9100	9200	9200
Area Harvested (1000 HA)	7991	7991	8800	9300	9200	9000
Beginning Stocks (1000 MT)	369	369	519	519	419	800
Production (1000 MT)	11100	11000	11300	11831	11700	11150
MY Imports (1000 MT)	0	0	0	0	0	0
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	11469	11369	11819	12350	12119	11950
MY Exports (1000 MT)	0	0	0	0	0	0
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Crush (1000 MT)	9750	9650	10100	10100	10200	10100
Food Use Dom. Cons. (1000 MT)	650	650	700	750	725	700
Feed Waste Dom. Cons. (1000 MT)	550	550	600	700	620	650
Total Dom. Cons. (1000 MT)	10950	10850	11400	11550	11545	11450
Ending Stocks (1000 MT)	519	519	419	800	574	500
Total Distribution (1000 MT)	11469	11369	11819	12350	12119	11950
(1000 HA), (1000 MT), (MT/HA)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 3: India: Oilseed, Peanut, Production, Supply and Distribution

Oilseed, Peanut Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Area Planted (1000 HA)	5705	5600	5800	5800	5500	5600
Area Harvested (1000 HA)	5705	5600	5000	5700	5500	5500
Beginning Stocks (1000 MT)	539	539	629	556	381	500
Production (1000 MT)	8700	6680	6300	7000	6600	6800
MY Imports (1000 MT)	2	2	2	2	2	2
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	9241	7221	6931	7558	6983	7302
MY Exports (1000 MT)	732	553	850	800	800	900
MY Exp. to EU (1000 MT)	7	20	10	10	10	10
Crush (1000 MT)	3855	3855	3700	3878	3650	3700
Food Use Dom. Cons. (1000 MT)	1525	1607	1550	1700	1600	1700
Feed Waste Dom. Cons. (1000 MT)	2500	650	450	680	575	680
Total Dom. Cons. (1000 MT)	7880	6112	5700	6258	5825	6080
Ending Stocks (1000 MT)	629	556	381	500	358	322
Total Distribution (1000 MT)	9241	7221	6931	7558	6983	7302
(1000 HA), (1000 MT), (MT/HA)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 4. India: Meal, Soybean, Production, Supply and Distribution

Meal, Soybean Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	USDA Official	New Post	USDA Official	New Post	USDA Official	New Post
Crush (1000 MT)	8500	8500	10200	10200	9900	9614
Extr. Rate, 999.9999 (PERCENT)	0.8	0.8	0.8	0.8	0.8	0.7801
Beginning Stocks (1000 MT)	189	189	422	550	192	180
Production (1000 MT)	6800	6800	8160	8160	7920	7500
MY Imports (1000 MT)	646	646	50	20	100	50
MY Imp. from U.S. (1000 MT)	0	4	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	7635	7635	8632	8730	8212	7730
MY Exports (1000 MT)	940	646	1800	1800	900	700
MY Exp. to EU (1000 MT)	239	268	37	80	200	120
Industrial Dom. Cons. (1000 MT)	0	0	0	0	0	0
Food Use Dom. Cons. (1000 MT)	400	439	425	450	450	450
Feed Waste Dom. Cons. (1000 MT)	5873	6000	6215	6300	6620	6430
Total Dom. Cons. (1000 MT)	6273	6439	6640	6750	7070	6880
Ending Stocks (1000 MT)	422	550	192	180	242	150
Total Distribution (1000 MT)	7635	7635	8632	8730	8212	7730
(1000 MT), (PERCENT)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 5. India: Meal, Rapeseed, Production, Supply and Distribution

Meal, Rapeseed Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Crush (1000 MT)	9750	9650	10100	10100	10200	10100
Extr. Rate, 999.9999 (PERCENT)	0.5957	0.6019	0.5955	0.6139	0.5951	0.5941
Beginning Stocks (1000 MT)	223	223	450	447	236	100
Production (1000 MT)	5808	5808	6015	6200	6070	6000
MY Imports (1000 MT)	1	1	1	3	0	0
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	6032	6032	6466	6650	6306	6100
MY Exports (1000 MT)	1207	1210	1650	1700	900	1100
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Industrial Dom. Cons. (1000 MT)	0	0	0	0	0	0
Food Use Dom. Cons. (1000 MT)	0	0	0	0	0	0
Feed Waste Dom. Cons. (1000 MT)	4375	4375	4580	4850	4970	4700
Total Dom. Cons. (1000 MT)	4375	4375	4580	4850	4970	4700
Ending Stocks (1000 MT)	450	447	236	100	436	300
Total Distribution (1000 MT)	6032	6032	6466	6650	6306	6100
(1000 HA), (1000 MT), (MT/HA)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 6. India: Meal, Peanut, Production, Supply and Distribution

Meal, Peanut Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Crush (1000 MT)	3855	3855	3700	3878	3650	3700
Extr. Rate, 999.9999 (PERCENT)	0.4189	0.4189	0.4189	0.4146	0.4189	0.4189
Beginning Stocks (1000 MT)	0	0	0	0	0	0
Production (1000 MT)	1615	1615	1550	1608	1529	1550
MY Imports (1000 MT)	0	0	0	0	0	0
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	1615	1615	1550	1608	1529	1550
MY Exports (1000 MT)	11	11	35	45	35	50
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Industrial Dom. Cons. (1000 MT)	0	0	0	0	0	0
Food Use Dom. Cons. (1000 MT)	5	5	5	8	5	7
Feed Waste Dom. Cons. (1000 MT)	1599	1599	1510	1555	1489	1493
Total Dom. Cons. (1000 MT)	1604	1604	1515	1563	1494	1500
Ending Stocks (1000 MT)	0	0	0	0	0	0
Total Distribution (1000 MT)	1615	1615	1550	1608	1529	1550
(1000 MT), (PERCENT)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 7. India: Oil, Soybean, Production, Supply and Distribution

Oil, Soybean Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Crush (1000 MT)	8500	8500	10200	10200	9900	9700
Extr. Rate, 999.9999 (PERCENT)	0.18	0.18	0.1799	0.1814	0.1798	0.1753
Beginning Stocks (1000 MT)	265	265	186	186	326	271
Production (1000 MT)	1530	1530	1835	1850	1780	1700
MY Imports (1000 MT)	4231	4231	3550	3550	3300	3400
MY Imp. from U.S. (1000 MT)	160	160	0	1	0	5
MY Imp. from EU (1000 MT)	286	286	57	120	150	160
Total Supply (1000 MT)	6026	6026	5571	5586	5406	5371
MY Exports (1000 MT)	15	15	15	15	15	15
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Industrial Dom. Cons. (1000 MT)	0	0	0	0	0	0
Food Use Dom. Cons. (1000 MT)	5825	5825	5230	5300	5050	5200
Feed Waste Dom. Cons. (1000 MT)	0	0	0	0	0	0
Total Dom. Cons. (1000 MT)	5825	5825	5230	5300	5050	5200
Ending Stocks (1000 MT)	186	186	326	271	341	156
Total Distribution (1000 MT)	6026	6026	5571	5586	5406	5371
(1000 MT), (PERCENT)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 8. India: Oil, Rapeseed, Production, Supply and Distribution

Oil, Rapeseed Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Crush (1000 MT)	9750	9650	10100	10100	10200	10100
Extr. Rate, 999.9999 (PERCENT)	0.38	0.3788	0.3802	0.3812	0.3804	0.3762
Beginning Stocks (1000 MT)	335	335	407	297	430	239
Production (1000 MT)	3705	3655	3840	3850	3880	3800
MY Imports (1000 MT)	34	34	25	7	25	10
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	4074	4024	4272	4154	4335	4049
MY Exports (1000 MT)	7	7	7	15	7	15
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Industrial Dom. Cons. (1000 MT)	70	70	70	100	70	100
Food Use Dom. Cons. (1000 MT)	3590	3650	3765	3800	3830	3850
Feed Waste Dom. Cons. (1000 MT)	0	0	0	0	0	0
Total Dom. Cons. (1000 MT)	3660	3720	3835	3900	3900	3950
Ending Stocks (1000 MT)	407	297	430	239	428	84
Total Distribution (1000 MT)	4074	4024	4272	4154	4335	4049
(1000 MT), (PERCENT)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 9. India: Oil, Peanut, Production, Supply and Distribution

Oil, Peanut Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Crush (1000 MT)	3855	3855	3700	3878	3650	3700
Extr. Rate, 999.9999 (PERCENT)	0.3302	0.3302	0.33	0.3223	0.3301	0.3243
Beginning Stocks (1000 MT)	190	190	228	228	254	186
Production (1000 MT)	1273	1273	1221	1250	1205	1200
MY Imports (1000 MT)	0	0	0	0	0	0
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	1463	1463	1449	1478	1459	1386
MY Exports (1000 MT)	40	40	110	130	100	110
MY Exp. to EU (1000 MT)	0	0	0	0	0	0
Industrial Dom. Cons. (1000 MT)	10	10	10	12	10	15
Food Use Dom. Cons. (1000 MT)	1185	1185	1075	1150	1050	1191
Feed Waste Dom. Cons. (1000 MT)	0	0	0	0	0	0
Total Dom. Cons. (1000 MT)	1195	1195	1085	1162	1060	1206
Ending Stocks (1000 MT)	228	228	254	186	299	70
Total Distribution (1000 MT)	1463	1463	1449	1478	1459	1386
(1000 MT), (PERCENT)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Table 10: India: Oil, Palm, Production, Supply and Distribution

Oil, Palm Market Year Begins	2021/2022 Oct 2021		2022/2023 Oct 2022		2023/2024 Oct 2023	
India	**USDA Official**	**New Post**	**USDA Official**	**New Post**	**USDA Official**	**New Post**
Area Planted (1000 HA)	5705	5600	5800	5800	5500	5600
Area Harvested (1000 HA)	5705	5600	5000	5700	5500	5500
Beginning Stocks (1000 MT)	539	539	629	556	381	500
Production (1000 MT)	8700	6680	6300	7000	6600	6800
MY Imports (1000 MT)	2	2	2	2	2	2
MY Imp. from U.S. (1000 MT)	0	0	0	0	0	0
MY Imp. from EU (1000 MT)	0	0	0	0	0	0
Total Supply (1000 MT)	9241	7221	6931	7558	6983	7302
MY Exports (1000 MT)	732	553	850	800	800	900
MY Exp. to EU (1000 MT)	7	20	10	10	10	10
Crush (1000 MT)	3855	3855	3700	3878	3650	3700
Food Use Dom. Cons. (1000 MT)	1525	1607	1550	1700	1600	1700
Feed Waste Dom. Cons. (1000 MT)	2500	650	450	680	575	680
Total Dom. Cons. (1000 MT)	7880	6112	5700	6258	5825	6080
Ending Stocks (1000 MT)	629	556	381	500	358	322
Total Distribution (1000 MT)	9241	7221	6931	7558	6983	7302
(1000 HA), (1000 MT), (MT/HA)						

Data source: OAA New Delhi historical data series. Post forecast for 2023/24; 2021/22 and 2022/23 are estimates.

Role of Lipids and Bioactive compounds in Edible Oils on Oxidative Stress and Inflammation

ABSTRACT

The present review aims to highlight the role of lipids and other bioactive compounds contained in edible oils on oxidative stress and inflammation, focusing on critical and controversial issues that recently emerged, and pointing to the opposing role often played by edible oils components and their oxidized metabolites.

Diet and inflammatory response are recognized as strictly related, and interest in exploring the potential of edible fats and oils for health and chronic diseases is emerging worldwide. Polyunsaturated fatty acids (PUFAs) present in fish oil (FO), such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), may be partly converted into oxygenated bioactive lipids with anti-inflammatory and/or pro-resolving activities. Moreover, the co-presence of phenolic compounds and vitamins in edible oils may prevent the development of chronic diseases by their anti-inflammatory, antioxidant, neuroprotective, and immunomodulatory activities. Finally, a high content in mono-unsaturated fatty acids may improve the serum lipid profile and decrease the alterations caused by the oxidized low-density lipoproteins and free radicals.

INTRODUCTION

Reactive oxygen species (ROS) are radical and non-radical chemical species formed by the partial reduction of oxygen that physiologically accumulate in parallel with cellular aerobic respiration. If unchecked, these compounds may result in DNA damages and cellular death. shows possible endogenous and exogenous sources of ROS, highlighting respiration as the major contributor to endogenous ROS production.

The body possesses defence mechanisms against ROS, such as specific enzymes (i.e., superoxide dismutase, catalase, and glutathione peroxidase) and thiolic antioxidant (i.e., glutathione, and albumin), and generates biologically active metabolites playing an important role in the physiological resolution of the inflammatory process. The diet may contribute to these processes by providing micronutrients, such as vitamin C and vitamins A and E, that can neutralize ROS, as well as macronutrients such as omega (ù)3 fatty acids that are substrates for the biosynthesis of resolution mediators.

Besides vitamins, other micronutrients can modulate inflammation, including minerals like Se, Cu, and Zn), while focusing on macronutrients (that is, dietary components supplying energy, such as proteins, carbohydrates, and fats), hyper-caloric Western diets based on energy-dense foods, rich in simple sugars, and low in fibres, greatly contribute to an increase of endogenous lipogenesis to store the excess of energy. This process leads to high serum levels of saturated fatty acids (SFAs) which, in turn positively correlate with inflammatory markers such as circulating fibrinogen. By contrast, consumption of polyunsaturated fatty acids (PUFAs) and ù3 fatty acids in particular, increases their circulating levels and shows opposite associations. Compared with omega3, omega6 fatty acids show variable effects on inflammation, and available data are controversial, but dietary, circulating monounsaturated fatty acids (MUFA s), especially oleic acid, may have anti-inflammatory effect.

The dietary patterns, according to their specific nutrient and food composition, can either help to preserve a functional health status, or increase the risk of Non –communicable chronic diseases (NNCDs)

The Mediterranean Diet (MD) is considered a healthy food pattern, especially considering its potential role in protecting against inflammation. The term "Mediterranean Diet" is usually referred to as a diet characterized by the high consumption of fruits, vegetables, whole grain cereals, seafood, legumes, nuts, and seeds, with a limited intake of meat and fermented beverages. Replacing the intake of SFAs with PUFAs is recommended by dietary guidelines focused on cardiovascular health, and consuming dietary oils derived from plants, seeds, or of marine origin is a strategy to increase the intake of PUFAs.

Plant-derived oils contain the two precursors of the ù6 and ù3 families, i.e., linoleic and alpha-linolenic acids (LA, ALA), together with protective micronutrients, such as tocopherols, carotenoids, phytosterol, beta-carotene, nitrogen compounds, minerals (e.g., phosphorous, magnesium, manganese, copper, iron, zinc, and potassium), vitamins, and phenolic compounds). Marine-derived oils, in particular oils from fatty fish, are an important source of ù3 fatty acids, predominantly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA;). Freshwater fish also ensures a good supply of ù6 PUFAs, but the possible presence of toxic contaminants or heavy metals and antibiotics may raise concerns in using fish oil (FO) as a source of PUFAs. Furthermore, undesirable flavours and tastes of FO may contribute to limiting their consumption.

Bioactive Compounds in Plant and Marine Oils

Fatty Acids	Sources	Function
Alpha-Linolenic Acid(ALA)	Flaxseeds, flaxseed oil, canola, (mustard / rapeseed) oil, soybeans and soybean oil, pumpkin seeds and pumpkin seed oil, purslane, perilla seed oil, walnuts and walnut oil.	The unique biochemical structure of alpha-linolenic acid is important and helps to make it a key player in immunity, vision, cell membranes, and the production of hormone like compounds.
Caprylic Acid	Coconut oil, palm nut oil, butter fat and other vegetable and animal sources, synthesized from caprylic alcohol (octanol) found in coconut oil.	Antifungal, antiseptic, candidicide, flavouring agent.
Docosahexaenoic Acid(DHA)	Herring, mackerel, salmon, sardines, human breast milk, liver, brain.	Plays a crucial role in the growth and development of the central nervous system as well as visual functioning in infants, reduces inflammation and promotes wound healing in burn victims, also prevents colon cancer or treats it in its early stages.
Eicosapentaenoic Acid(EPA)	Cod liver oil, herring, mackerel, salmon (not farm raised), sardines, human breast milk.	Improves cardiovascular health and may prevent the accumulation of plaque (cholesterol and fat) on the walls of the arteries.

Fatty Acids	Sources	Function
Gamma-linolenic acid(GLA)	Borage oil (18-26%), black currant oil (15-20%), evening primrose oil (7-10%), fish, human mother's milk, fungal oils, spirulina (often called blue-green algae).	Reduces inflammation and prevents diseases; is much stronger than the information regarding use of GLA for these purposes.
Omega-3 Fatty Acids	Flaxseed, fish oil, cod liver oil, krill and fortified everyday foods like bread and fruit juices, whole grains, fresh fruits, vegetables, fish, olive oil, garlic, moderate wine consumption.	Plays an important role as structural membrane lipids, particularly in nerve tissue and the retina and are precursors to eicosanoids - highly reactive substances such as prostaglandins and leukotrienes that act locally to influence a wide range of functions in cells and tissues.
Omega-6 Fatty Acids	Cereals, eggs, poultry, most vegetable oils including Rice bran Oil, whole-grain breads, baked goods, organ meats, margarine.	Reduces the aches and pains of rheumatoid arthritis, relieves the discomforts of PMS, endometriosis, and fibrocystic breasts, reduces the symptoms of eczema and psoriasis, clears up acne and rosacea, prevents and improves diabetic neuropathy.
Omega-9 Fatty Acids(Oleic Acid)	Avocado fruit, Macadamia nuts, apricot seeds, almonds, olive oil.	Lowers blood levels of cholesterol.
Vitamin F(Fatty Acids)	Evening primrose oil, grape seed oil, flaxseed oil, and oils of grains, nuts and seeds, such as soybean, walnuts, sesame, sunflower, avocados, meat and fish like salmon, trout, mackerel and tuna.	Essential fatty acids maintain the function and integrity of cell membranes, transport, breakdown and excrete cholesterol and act as precursors to prostaglandins required in many physiological functions. Regulates oxygen use, electron transport and energy production. Helps form homo globin, maintain exocrine and endocrine glands, make joint lubricants. Regulates blood pressure, platelet coagulation, kidney function; helps transport cholesterol, needed by active tissues; brain, retina, adrenal, testes; helps eliminate toxic peroxides, helps prevent allergies.

Oil	Sources	Function
Borage Oil	Black currant seed oil.	Improves circulation and hormonal balance-a great choice for women with PMS symptoms.
Cod Liver Oil	Fish.	Helps delay or even reverse the destruction of joint cartilage and inflammatory pain associated with arthritic disease, improves circulation and hormonal balance-a great choice for women with PMS symptoms.
Evening Primrose Oil	A small yellow wildflower (Oenothera biennis) has been used medicinally for centuries. The oil, pressed from the seed, is rich in linoleic acid, an essential fatty acid (EFA)and Gamma Linolenic Acid.	Cures, treats, or prevents practically everything-from rheumatoid arthritis, breast pain, hot flashes, premenstrual syndrome, eczema, and other skin problems to diabetic neuropathy, cancer, high blood cholesterol levels, and heart disease.
Fish Oil	Menhaden, pilchard, sardine, herring, salmon and fresh tuna.	Prevents heart disease, depression, cancer; alleviates auto-immune disorders, plus many other claims.
Fish Liver Oil	High potency livers from cod, shark, halibut.	Helps regulate the rhythm of the heart, prevent cardiac arrhythmias.
Flaxseed Oil	Flaxseed oil is obtained from the seed of the flax plant. It contains 50% to 60% omega-3 fatty acids. This amount is roughly double that contained in fish oil.	Prevents heart disease and cancer. Helpful in treating high cholesterol, high blood pressure, heart disease, inflammatory bowel disease (IBD), arthritis, breast cancer, depression, burns, acne, asthma, menstrual pain; also proven helpful in protecting against certain infections and treating a variety of conditions including ulcers, migraine headaches, preterm labor, emphysema, psoriasis, glaucoma, Lyme disease, lupus, and panic attacks.
Linseed Oil.	Dried ripe linseeds	Commission E Indications-External: Local inflammation (cataplasm). Internal: Chronic constipation, colon damaged by laxative abuse, irritable colon, diverticulitis, gastritis (mucilage), irritable bowel syndrome, enteritis (mucilage).
Safflower Oil	Oil expressed from the seeds of the safflower	Beneficial for painful inflamed joints, and applied to bruises, sprains, and painful arthritis.
Wheat Germ Oil	Triticum aestivum, Triticum sativum, Triticum vulgare.	Promotes healthy skin. A natural antioxidant which helps to prevent rancidity.

Role of Long Chain PUFAs, MUFAs and Polyphenols

Available evidence indicates that consumption of LC-PUFAs, MUFAs, and polyphenols from edible oils correlates to decreased levels of oxidative stress and inflammation. Dietary lipids act directly and indirectly through the formation of oxygenated metabolites possessing potent biological activities, such as eicosanoids and specialized pro-resolving mediators. In consideration of the different and often opposing biological activities of the families of LC-PUFAs oxygenated derivatives, it is of critical importance to assess the relative abundance of their precursors in cell membranes resulting from specific dietary habits, because LC-PUFAs may compete for the same metabolic pathways, affecting the resulting levels of bioactive metabolites in organs and tissues.

The sensibility of LC-PUFAs to peroxidation may also lead to the formation of a number of biologically active metabolites, that in parallel to what observed for enzymatic metabolites possess often opposing biological activities, enhancing inflammation, oxidative stress, and cellular damage on one side, and promoting the resolution of the inflammatory response on the other hand. Recently a web-based interactive interface has been made available to search for thousands of interconnected biochemical pathways leading to specific phenotypes of relevance for the inflammation and its resolution process.

The Mediterranean Diet, thanks to its high supply of vegetables, seeds, and marine food sources rich in ù3 lipids, may be considered an anti-inflammatory diet, and the beneficial roles of plant, seeds, and marine-derived oils in the human body are of growing interest. Major consumption of these oils in their present form, or as nutraceutical supplements, as is the case of oils from fish and algae, may highly contribute replacing SFAs with PUFAs in dietary patterns. Nevertheless, the health benefits associated to increased PUFAs concentration in cellular membranes have been the object of significant debate with the most comprehensive meta-analysis to-date still supporting the efficacy of marine omega3 supplementation in reducing cardiovascular risk.

CONCLUSION

It must be noted that the high heterogeneity in oil composition, inclusive of both the fat and the non-fat components, even from the same primary sources, as well the heterogeneity of clinical study designs reporting the beneficial effects of edible oils, may play a significant role in the health outcome associated to their consumption.

Available evidence indicates that consumption of LC-PUFAs, MUFAs and polyphenols from edible oils co-relates to decreased levels of oxidative stress and inflammation.

Compiled by:

C.S. Joshi,
Director, FARELABS Pvt. Ltd. Gurugram

With coronavirus on the upswing in US, new vaccine coming sooner than expected

With coronavirus cases increasingly on the upswing across California and the nation, an updated COVID-19 vaccine is expected to come out even earlier than expected.

Coronavirus transmission has been rising this summer and hospitalizations, while still low, have recently started to tick up as well.

In Los Angeles County, COVID-19 levels have risen for the fifth consecutive week, with the number of newly reported infections likely growing because of travel, the back-to-school season and new Omicron subvariants, health officials said.

New outbreaks are up at L.A. County's nursing homes, and one Hollywood studio temporarily imposed a mask mandate after several employees were infected. Nationally, there were 12,613 weekly COVID-19 hospitalizations for the week that ended Aug. 12 — double the number from the start of this summer, but just one-third of the level seen at this time last year.

The U.S. Food and Drug Administration said this year's updated version of the COVID-19 vaccine is likely to come out by the middle of next month, a bit earlier than the late September timeline previously announced by the Department of Health and Human Services.

The earlier-than-expected arrival became apparent after the U.S. Centers for Disease Control and Prevention scheduled a Sept. 12 meeting of its Advisory Committee on Immunization Practices, a likely indication that the vaccine would become available shortly afterward.

The latest version of the vaccine is designed against the Omicron subvariant XBB.1.5, unofficially known as Kraken. Unlike last year's formulation, a bivalent vaccine that was designed against both the ancestral coronavirus strain and the BA.5/BA.4 Omicron subvariants that were circulating at the time, the upcoming vaccine will be monovalent, specifically designed against XBB.1.5.

Kraken, dominant as of this spring, has seen other upstart subvariants rise to compete against it, such as XBB.1.16 (unofficially refered to as Arcturus) and EG.5 (also known as Eris). The differences between these subvariants are relatively minor, and it's expected the new vaccine will be effective against all three.

But officials are closely watching another subvariant that has raised more questions: BA.2.86, nicknamed Pirola, after an asteroid.

In a CDC risk assessment, the agency said that Pirola "may be more capable of causing infection in people who have previously had COVID-19 or who have received COVID-19 vaccines."

Source: Los Angel Times

How prolonged blood pressure is a serious heart health risk

High blood pressure, also known as hypertension, is a common health concern that affects millions of people worldwide. While it might seem like a minor issue, untreated or uncontrolled hypertension can have severe consequences for your heart and blood vessels. In simple terms, uncontrolled hypertension, experts note, can cause damage to your vital organs.

Hypertension is often referred to as the 'silent killer' because the symptoms of this disease do not appear quickly. Blood vessels in the body are like tiny, delicate tubes and they carry blood to every cell and organ in the body. However, when blood pressure rises, the blood vessels become stiff or constricted. In such cases, the blood vessels are not able to carry enough blood to the body. This damage increases the risk of blockages, which can lead to

heart attacks, said Dr Shivraj Ingole, consultant vascular specialist, Apollo Spectra Mumbai.

Over time, this relentless pressure can harm the delicate lining of your **blood vessels**, making them less elastic and more prone to damage.

Most people with high blood pressure don't experience obvious symptoms until it's too late. Vascular disease is the term used to describe the damage that happens to your blood vessels when **high blood pressure** is left unchecked. It's not just your heart that's at risk; your entire circulatory system can be compromised. The prolonged stress on your blood vessels can lead to the formation of dangerous plaques made up of cholesterol, fat, and other substances. These plaques can narrow and clog your arteries, making it harder for blood to flow. This can lead to a heart attack," elucidated Dr Ingole.

Know the impact of stress on your heart health

People across the globe will observe World Heart Day 2023 on September 29 to raise awareness about heart issues. As we all know stress can have a significant impact on heart health. Chronic stress, in particular, can contribute to the development of various cardiovascular problems. Stress triggers the release of stress hormones like adrenaline and cortisol, which can temporarily elevate blood pressure and heart rate. This can lead to hypertension or sustained high blood pressure, a major risk factor for heart disease. According to *Dr Chandrashekhar, Associate Director, Cardiac Sciences, Cardiology, Cardiac Electrophysiology-Pacemaker, Max Super Speciality Hospital, Shalimar Bagh,* chronic stress can also disrupt the heart's normal rhythm, potentially leading to arrhythmias or palpitations.

Stress also promotes inflammation throughout the body, which plays a pivotal role in the development of atherosclerosis. Atherosclerosis involves the buildup of plaque in the arteries, narrowing them and reducing blood flow to the heart. This can culminate in heart attacks or strokes.

Stress often leads to unhealthy behaviours like overeating, smoking, excessive alcohol consumption, or a sedentary lifestyle when stressed, all of which increase the risk of heart disease. Stress can also encourage blood clot formation, heightening the risk of heart attacks and strokes.

Chronic stress can cause weight gain, particularly around the abdomen, which is linked to heart disease. Sleep problems, often a consequence of stress, further exacerbate heart health issues. Poor sleep quality is associated with an increased risk of cardiovascular problems.

Conditions like anxiety and depression, which are often associated with chronic stress, indirectly affect heart health. Individuals with mental health issues are more prone to unhealthy behaviours and less likely to adhere to recommended medical treatments.

To reduce the impact of stress on heart health, adopting healthy lifestyle and stress management techniques is essential. Lifestyle changes, including regular physical activity, a balanced diet, and adequate sleep, can help reduce stress-related risks. Seeking professional help, such as therapy or counselling, may be necessary for individuals with chronic stress or stress-related mental health conditions. Therefore, proactive stress management and adopting a heart-healthy lifestyle are crucial for maintaining good heart health.

ALSO READ: World Heart Day 2023: What is the difference between heart disease risks and symptoms of men and women?

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Why are women more likely to die of cancer?

The report, titled "Women, Power and Cancer," highlights how societal apathy towards women's health, lack of knowledge, awareness and absence of quality expertise at the primary care level delayed their access to cancer prevention, detection and care. The study authors found that nearly two-thirds of the cancer deaths in Indian women were preventable and 37 per cent were treatable if only they had been diagnosed on time and accessed optimal care. Around 6.9 million cancer deaths in women were preventable and 4.03 million were treatable.

Dr Ishu Kataria, Commissionr, Lancet, pointed out that women in India diagnosed with cancer died because of family apathy, their own indifference to their condition, lack of access and finance. Emphasising the need for a feminist approach to cancer, she says, "We need cancer to be seen as a priority issue in women's health. Women interact with cancer in various ways, not only as people living with the disease but also as unpaid caregivers, individuals participating in cancer prevention and screening at the national level, healthcare providers, researchers and policy makers. In this context they face gender bias and discrimination on multiple fronts, be it due to their age, ethnicity, socio-economic status, gender identity or sexual orientation. This hinders their ability to seek good quality care for both diagnosis and treatment."

The impact of carbs and fats on longevity

When it came to carbohydrate consumption, the researchers found that, in the study cohort, men who got fewer than 40% of their daily calories from carbohydrates were at a significantly higher risk of all-cause mortality.

For women, by contrast, those who got more than 65% of their calories from carbohydrates were at a higher all-cause mortality risk.

The researchers found no appreciable difference between the effect of consuming minimally processed carbohydrates versus refined carbohydrates.

Regarding dietary fat, men who got more than 35% of their calories from any kind of fat were at a higher risk of cancer and cardiovascular mortality.

In men, when the quality of fat intake was examined, no clear association was observed for saturated fat intake. However, consuming less unsaturated fat was associated with a higher risk of all-cause and cancer-related mortality.

For women, consuming more fats — particularly saturated fats — decreased their risk of all-cause and cancer mortality.

The study involved 34,893 men and 46,440 women, ranging in age from 35 to 69 years. The average body mass index (BMI) for men was 23.7, and for women 22.2, within the healthy rangeTrusted Source.

Caveats about the study findings

According to cardiology dietician Michelle Routhenstein, who was not involved in the research, "[t]his study suggests that low carbohydrates in diet and low-fat weight loss diets for women can decrease longevity."

Clinical nutrition epidemiologist Prof. Linda Van Horn, who was also not involved in the study, expressed concern that Americans may take the wrong message from its findings.

"It does not suggest anything about [fad diets]," said Dr. Van Horn, "nor should these studies [be] conducted using different methods across different populations and mostly not in the United States with

its high rate of obesity, intake of ultra-processed foods and generally low nutrient adequacy."

In the United States, nearly one in three, or 30.7%, of adults qualify as having overweight, and two in five, or 42.4%, qualify as having obesity.

Dr. Van Horn added: "The U.S. Dietary Guidelines Trusted Source take all of these considerations into account, and are far more reliable than attempting to extract meaningful applications from this cohort study with a mean BMI of 23.7 in men and 22.2 in women!"

She also expressed concern that some deaths described in the study may represent "poverty and inadequate nutrient intake overall, and are unlike the U.S. population."

Sources of saturated and unsaturated fats

"Some sources of saturated fat include red meat, coconut oil, butter, palm oil, and full-fat dairy," said Routhenstein. Prof. Van Horn also notes that "saturated fats are derived from animal sources: butter, cream, bacon, processed meats."

"Some sources of unsaturated fats," Routhenstein pointed out, "include avocados, olives, pecans, and pumpkin seeds." Prof. Van Horn added corn oil to the list, as well as nuts and seeds in general.

The risk of low carbohydrates in men

If men require at least 40% of their calories from carbohydrates to avoid reducing their longevity, why might that be, and why might they struggle to obtain the necessary carbs?

Prof. Van Horn suggested that "[i]n this study, [this is] likely due to poor dietary quality, poverty-related lack of adequate healthy care, smoking, [and] alcohol."

"Diets low in carbohydrates, lack dietary fiber, and nutrients such as magnesium, potassium, vitamin C, and B vitamins, which are essential for our bodies to thrive. When we lack these protective nutrients, it can increase the risk of some cancers."

– Michelle Routhenstein

The study suggests a shortfall in bioactive dietary components may be at play. Specifically, the authors mention fiber, heme iron, vitamins, minerals, branched-chain amino acids, fatty acids, and phytochemicals as being in short supply.

The authors of the study also mention that a diet lacking in plant sources — particularly when animal products make up the difference — has been seen to encourage inflammatory pathways, cause more rapid biological aging, and produce oxidative stress.

The need for more dietary fats in women

Prof. Van Horn suggested that given female participants' "low BMI, it may be likely that they eat less sugar and drink less alcohol, and thus consume higher percent fat compared to the men."

"But […] this is all speculative because these questions are not addressed in the paper," she cautioned.

Routhenstein noted the need in women for "a certain amount of fat in order to produce adequate hormones like estrogen, which are cardioprotective."

The authors themselves do not speculate on this, but note that the intake of saturated fat was inversely linked to mortality risk only among women.

The study supports the need for further research. For people in the U.S. and other Western countries, a similar study done with a more locally representative population may provide more actionable findings that consider the local dietary and health landscape.

PATCHOULI ESSENTIAL OIL

Introduction

Patchouli oil is an essential oil extracted from patchouli (***Pogostemon cablin***) leaves by distillation or other methods such as solvent extraction method and supercritical CO2. Patchouli oil is one of Indonesian most important commodity for export purpose. This essential oil is always in high demand to be traded internationally and added as an essential ingredient for perfumery industries, cosmetics, soaps, detergents, and pharmaceuticals.

A wide range of industrial application of patchouli oil is particularly due to its typical strong scent and most importantly its function as a fixative agent. A fixative agent is a substance used to reduce the rate of evaporation and is able to increase the mixture stability when added to more volatile components. The fixative properties of patchouli oil are mainly contributed by patchouli alcohol (C15H26O) as the main component which can classified into oxygenated terpenes. Other major constituents in patchouli oil are σ-guaiene, a-guaiena, seychellene, a-patchoulene, carryphylene, β- patchoulene, pogostol, and norpatchoulenol.

Typical patchouli oil extracted by farmers has low level of patchouli alcohol commonly below 30%. This low grade oil consequently produces patchouli oil with low market price. The level of major components in patchouli oil can be increased by appropriate determination of fractional distillation temperatures and pressures.

Cultivating and Harvesting Patchouli Essential oil:-

Patchouli oil comes from a species of plant with the ***genus Pogosternon*** by using Extraction process. This bushy herb has rigid stems, reaching 2 or 3 feet in height, and produces small, pale pink flowers. The plant is native to tropical regions of Asia and is now widely cultivated in China, India, Malaysia, Indonesia, Mauritius, the Philippines, Taiwan, Thailand, and Vietnam.

The Patchouli plant thrives in the hot, humid temperatures of tropical countries and can be grown near rice paddies or in open fields. It is commonly found growing near Coconut, Pine, Rubber, and Peanut trees. The most common method of

cultivating Patchouli is by planting cuttings from the mother plant after they are placed in water.

As long as the Patchouli plant receives adequate sunlight and water, it can produce on flat or sloped land. The Patchouli leaves grow thick and small but contain a high concentration of essential oils. Less exposure to sunlight results in Patchouli leaves that are bigger, but that yield a lower volume of essential oils. Sufficient water drainage is essential, as high water levels can cause the roots to decompose. The ideal soil for increasing the Patchouli plant is soft, not tightly packed, and is rich in nutrients and organic matters. It should have a pH level that is between 6 and 7. In this ideal environment, Patchouli plant can potentially grow to a height of 2 and 3 ft.

The area in which the Patchouli botanical grows must be free of all weeds and it should be maintained through fertilization and protection against insect infestations. Patchouli matures at the 6 to 7-month mark and can be harvested at this point. The seeds that are formed by the plant's small, light pink, fragrant flowers, which bloom in late autumn, can be further harvested to grow more Patchouli plants. The setback of this secondary process of growing Patchouli from its flower seeds is that, due to their extreme fragility and small size, if the seeds are handled inaccurately or crushed in any manner, they become unusable.

Patchouli leaves could be harvested more than once a year. The leaves are collected by hand, bundled together, and allowed to partially dry in the shade. The leaves are then allowed to ferment for a few days, after which they are exported to the distillery.

Extraction of Patchouli Essential Oil:

Patchouli oil is extracted from the young leaves which are dried and fermented prior to steam distillation and yields 2 to 3 %. This Patchouli oil improves with age to have a fuller, better-rounded odor.

The equipment used in Patchouli oil extraction process are steam generator or boiler, Heat exchanger separator distillation steel gantry and lifting equipment coolers condenser, receiver and dry cooler.

Steam distillation of Patchouli Essential Oil:

Patchouli is a farmer-friendly crop because it is simple to handle, unlike other aromatic plants. Moreover, the leaves once dried and accurately preserved can be used for distillation leisurely. The essential oil is originated in all parts of the Patchouli plant including the root, but experiments have shown that the top leaves and tender twigs contain the highest quality oil.

Generally, dry leaves stored for 4 to 6 months produce more oil with superior aroma. Steam distillation is the common process used for the extraction of essential oils from plants. Although there are other extraction methods (hydro distillation, microwave distillation, supercritical fluid extraction, ultrasound extraction), from the consumer point of view steam distillation remains the preferred method for the extraction of essential oils from plant materials. The steam distillation equipment consists of a boiler, distillation still, condenser and receiver. The distillation still is normally made up of mild steel with perforated bottom to support loaded herb for distillation. The herb should be evenly or tightly packed inside the still as otherwise, stream channels may form during the distillation resulting in poor yield of essential oils. The water level in the boiler must be well maintained by frequent checking.

Maintenance of high and low pressures, i.e. 1.4 to 3.5 kg/m2 produces better quality as more cell walls rupture in this procedure. The duration of the distillation varies from 6 to 8 hours. The condenser will cool the vapors received from the distillation still. It consists of several tubes made up of stainless steel and mounted inside a jacket. The condenser is provided with inlet and outlet for circulation of cooling water. The hot vapors consisting of steam and patchouli essential oil vapors are cooled in the condenser tubes and the condensate flows out into the receiver. The patchouli essential oil vapor and spent steam that comes out of the distillation still

will be condensed back to the liquid phase in the water cooled condenser and the condensate will be collected in the receiver tank.

Steam distillation process results in two separate products they are the liquid distillate which contains the volatile, water-soluble parts of the Patchouli plant materials known as "hydrosol" and the volatile non water soluble part of the plant constituents known as the "essential oil". The condensate in the receiver tank should be allowed to stand for sufficient time so that the patchouli oil separates out as far as possible from the water layer. After the reasonable separation in the receiver tank, the Patchouli essential oil should be further separated from the water phase using a separating Funnel. The Patchouli oil being lighter than water and insoluble floats on the top of the receiver and only water get drained out. The oil will be still turbid. All traces of moisture needs to be removed from the oil by adding anhydrous sodium sulfate at the rate of 20 to 30 g/L and keeping the distillate mixture for 4 to 5 h, after which the oil is filtered through a filter media to get clear essential oil. Moisture can induce polymerization of Patchouli oil leading to a loss in quality.

Fractionation of Patchouli Oil procedure:

Patchouli oils from two sources (patchouli oil A and B) were used in which each of them has different initial quantity of patchouli alcohol (PA): PA-1, 27.03% and PA-2, 36.87%. Separation of patchouli oils into their fraction were carried out by fractional distillation method. Two variables were examined, initial content of patchouli alcohol (27.03%; 36.87%) and fractionation temperatures (120°C, 125°C, 130°C, 135°C). Different initial values might influence the final patchouli alcohol fraction. Fractional distillations were performed at 100 mbar.

As a common practice, the patchouli oil is extracted from patchouli leaves by steam distillation.

Special features of Patchouli Essential Oil:

Patchouli oil is an important ingredient and used as a 'base' material in the perfumery industry. Patchouli essential oil is perfume by itself. There is no synthetic substitute or chemical for patchouli oil, which increases its value and demand in the perfumery market. Patchouli essential oil mixes well with many other essential oils including vetiver, rosemary, sandalwood, frankincense, bergamot, cedar wood, myrrh, jasmine, rose, citrus oils, lemongrass, geranium, and ginger, contributing a rich spicy aroma.

Measurement of oil Physico-chemical properties:

Measurement of the oil physico-chemical properties including specific weight, refractive index, optical rotation, solubility in alcohol, acid value, ester value, and determination of patchouli alcohol content. All of these parameters are described in the SNI 06-2385-2006.

Identification of chemical composition and chromatographic analysis:

Identification of chemical composition is determined by gas chromatography–mass spectrometry (GC-MS) instrument. The GC analysis of the oils was performed on gas chromatograph, fitted with a Stabil wax capillary column, 30 m x 0.25 mm x 0.25 um, and a flame ionization detector (FID). Helium was the carrier gas, performed under split injection mode. The oven temperature was set initially at 100 °C for 2 min and increase to 160 °C at the rate of 5°C/min for 5 min, then to 220 °C at the rate of 10 °C/min and hold for another 10 min.

The GC-MS analysis was performed on a gas chromatograph (Shimadzu GCMS-QP 20105), using a fused-silica capillary column (Rtx-5MS), coupled to a selective mass detector. The injector temperature was 300°C. The initial oven temperature was 80°C. The carrier gas was helium with a flow rate of 0.68 mL/min. The sample volume injected was 1 µl with a split rate of 99.7. Identification of each fraction of the patchouli oil was based on the comparison with GC-MS library (Electronic Wiley Library).

Table 1. The Physico-chemical properties of Patchouli Oil A and B

Parameters	Patchouli oil A	Patchouli oil B
Colour	yellow-brown	yellow-brown
Specific weight (25°C/ 25°C)	0.964	0.965
Refractive index ($_nD^{20}$)	1.513	1.515
Solubility in alcohol 90%	Clear solution in Volume ratio o Of 1:10	Clear solution in volume ratio of 1:10
Acid value	0.50	0.52
Esther value	12.62	12.65
Optical rotation	(-) 52°	(-) 53°
Patchouli Alcohol	27.03%	36.87%
Alpha copaene (%)	Not detected	Not detected

Table 2. Composition of Patchouli Oil A and B

Peak Number	Retention Time (min)	Compound	Patchouli OIL A (%)	Patchouli Oil B (%)
1	10.19	β-patchoulene	3.32	2.51
2	10.34	β –elemene	1.25	0.93
3	10.89	Seychellene	0.93	0.54
4	11.09	trans-caryophyllene	4.61	2.96
5	11.54	a-guaiene	14.15	10.41
6	15.26	seychellene	8.25	6.51
7	11.92	a-humulene	1.07	0.73
8	12.04	a-patchoulene	5.94	4.92
9	12.11	σ-gurjunene	2.69	2.14
10	12.17	Patchoulene	1.13	0.93
11	12.26	trans-caryophyllene	0.70	0.54
12	12.42	a-guaiene	0.81	0.65
13	12.74	Eremophilene	0.95	0.79
14	12.97	a-guaiene	5.35	0.63
15	13.20	σ-guaiene	16.35	15.02
16	15.10	caryphyllene	0.74	0.96
17	16.26	benzocyclohepten	1.08	1.23
18	17.31	veridiflorol	2.78	4.51
19	17.63	patchouli alcohol	27.03	36.87
20	19.47	2H-pyran-2-one	0.87	1.02

Patchouli Essential Oil storage:

The Patchouli oil has a naturally very long shelf life with many users preferring older oils, which tend to darken with age. This is based upon proper storage away from direct sunlight, air, and moisture. We advise a 36-month initial shelf life from analysis date, with the capability to extend based upon annual checks for several decades.

When stored in cool, dark conditions in full containers Patchouli essential oil has an extremely long shelf life (several decades) with perfumers advising that Patchouli improves with age. The Patchouli essential oil thus obtained must be stored in air-tight aluminum containers or color glass bottles up to the brim and stored in a cool dry place, away from light.

Uses of Patchouli Essential Oil:

Patchouli oil has a characteristic scent that might be described as woody, sweet, and spicy. Because of this, it's often used as a scent additive in products like perfumes, cosmetics, and incense.

Patchouli oil has a variety of additional uses throughout the world. Some of these include:

1. treating skin conditions such as dermatitis, acne, or dry, cracked skin
2. easing symptoms of conditions like colds, headaches, and stomach upset
3. relieving depression
4. providing feelings of relaxation and helping to ease stress or anxiety
5. helping with oily hair or dandruff
6. controlling appetite
7. using as an insecticide, antifungal, or antibacterial agent
8. using as an additive in low concentrations to flavor foods like candies, baked goods, and beverages

Precautions:

Patchouli oil doesn't often elicit irritation or an allergic response when applied to the skin. But you should still be careful when initially applying it in case a reaction occurs. Never apply undiluted patchouli essential oil to the skin.

Because patchouli oil can affect blood clotting, the following people should avoid using patchouli oil:

- those taking blood-thinning medication
- individuals who have recently had or will be undergoing major surgery.
- those with bleeding disorders, such as hemophilia

As always, it's important to remember that essential oils are very concentrated and should be properly diluted before using on the skin or for aromatherapy.

Never eat or drink any essential oil without first consulting a qualified medical professional.

Compiled by:

Dr. S. Adhikari

LAUGH AND LOUD

Q. What do you call the number seven and the number three who got married?

A. The odd couple.

****

Q. What did the stamen say to the pistil?

A. I like your style!

****

Q. Why was the equal sign so humble?

A. Because she knew she wasn't greater than or less than anyone else.

****

Q. HOW TO CLASSIFY SCIENCE ?

A. If it moves …… It is BIOLOGY
If it stinks……. It is CHEMISTRY
If it does not work …… It is PHYSICS

****

Q. STOP PITTING SCIENCE AGAINST EACH OTHER

A. Biology is AMAZING
Chemistry is ENJOYABLE
Physics is SOCIAL SCIENCE IN INTERM
Computer Science is FUN

****

A while ago in my AP Chemistry class, this annoying kid and my friend were having a weird arguments about who was better. The annoying kid said "well at least I have a girlfriend!" to which I responded. "Whatever", " Your girl friend has 67 Protons". In response the entire class including the teacher turned around their heads to look at the periodic table on the wall. The element with 67 Protons is HOLIUM with chemical sign "HO".

****

Reason I am basically "A PLANT "

- ADORABLE
- SMALL
- NEEDS WATER AND SUNLIGHT
- WILL WHITHER AWAY AND DIE IF IGNORED
- GROWING.

****

Q. How much room does fungi need in order to grow ?

A. As mushrooms as possible.

****

Q. Do you hear about a New Resturant on the Moon?

A. Food was good but there was no atmosphere.

****

Q. Methyl was playing outside so his mom called out the window for him to come home. She was quite surprised, however, when Dimethyl Ether, their neighbour, came instead. Why?

A. Because she called "CH3 - O - CH3!".

****

Q. Why did the chemistry teacher who specializes in organic chemistry lead a troublesome life?

A. Because he often finds himself in alkynes of trouble!

****

Q. What is the chemical formula for "coffee"?

A. CoFe2

****

Q. What's the difference between the bird flu and the swine flu?

A. One requires treatments and the other requires ointment.

****

Study of Transfer of Thermal Energy Using Heat Pipe Principle

by Chetan Tripaathi, Grade XII, Heritage Xperiential Learning School, Gurgaon, Haryana-122011

Abstract

A heat pipe is a device used for the quick transfer of thermal energy due to thermal gradients and brings a highly stable thermal source that can be used for precise and accurate temperature measurement. In relation to the working principle of a heat pipe, I have fabricated a heat pipe using a glass structure. A study has been made to demonstrate the functioning of a heat pipe in a simple way. The heat pipe consists of an evaporator (bottom) and a condenser (top portion). We have measured the temperature of the heat pipe vertically using a stable heating source. The consistency of readings shows that heat pipe works in the environment of thermal gradients to transfer thermal energy in a very short time. The findings demonstrate that a heat pipe constructed using glass tubes and stainless-steel mesh can achieve high levels of thermal conductivity and efficient heat transfer while remaining cost-effective. This research has the potential to expand the use of heat pipe technology in a wide range of applications, particularly in contexts where cost is a significant concern. Overall, this paper proves that heat pipes are a more efficient and effective medium of heat transfer compared to other mediums.

Introduction and Working Principle

A heat pipe is sealed under a vacuum with a small amount of working fluid in a tube with a conducting mesh of high porosity and surface area. The heat pipe consists of an evaporator (bottom) and a condenser (top portion). When the evaporator part is heated the fluid moves towards the condenser and it carries thermal energy through vapors as well as a liquid due to absorption through a wick by capillary action. The action is so quick that the tube becomes hot throughout its length. This makes the tube uniformly heated, and it refers to the temperature reaching uniformly stable. Using the pressure created by the temperature difference, the hot fluid vapor swiftly spreads to the opposite end of the heat pipe. At the opposite end, known as the condenser, the fluid gives up its latent heat to sink and condenses to liquid. The fluid transformed thus into the liquid form, using the capillary force induced from the wire mesh structure and gravity, returns to the evaporator section of the heat pipe (without application of any external force).

The effective heat conductivity of a heat pipe is about 90 times more than that of solid copper [1]. This is the reason that heat pipes find their application in many ways like in thermal metrology, medical and healthcare facilities, the automotive industry, hydrogen storage, etc. [2]

The focus of the current study is to demonstrate a simple yet effective heat pipe model using glass tubes, a stainless-steel mesh, thermocouples, water, and a vacuum system. It also aims to explore the feasibility of constructing a heat pipe using basic materials such as glass tubes and stainless-steel mesh. The cost of traditional heat pipes can be prohibitive, limiting their use in certain contexts. In this study, we investigate the use of low-cost materials in constructing a heat pipe, examining their thermal conductivity and heat transfer capabilities.

Description of the experimental setup

Figure 1A shows a vacuum-sealed glass tube. This tube was chosen as a reference setup to compare it with the heat transfer using heat pipe principles.

The heat pipe designed for this study uses an identical glass tube but with a wire mesh as shown in Figure 1B. Figure 2 also shows the photograph of the experimental setup used for the study.

The following materials have been used for the heat pipe model:

- Glass tubes
- Wire Mesh, 400 holes per cm^2
- Distilled Water
- Dry Ice (Solid CO_2) / Liquid Nitrogen
- Type-T Thermocouples
- Digital logger Fluke Super DAQ 1586 (used for temperature measurement)
- Fluke Metrology Well (heat source)

A glass tube is sealed under a vacuum with a small, prescribed amount of working fluid in a tube of Glass. A wick of wire mesh size about (400 holes/ cm^2) is inserted inside the tube to fit in the inner surface. About 10 ml of water is filled in the tube as a working fluid. The tube assembly containing the wire mesh was rolled and placed inside the glass tube with an inner diameter of 15 mm and an outer diameter of 18 mm. With distilled water, the lower portion of about 50 mm of the tube is placed in the pot containing solid CO2 (dry ice) for about 30 min to freeze the water inside the glass tube. Now the glass tube is connected to a vacuum pump to evacuate the tube and at the same time seal it in situ so that a vacuum is created in the tube. The heat pipe is now ready for use.

An identical glass tube (**Figure 1A**) is similarly vacuum sealed without the wire mesh to compare the efficiency of heat transfer with and without the wire mesh. Five T-type TCs are fixed at an equidistant location in the heat pipe as shown in the figure below.

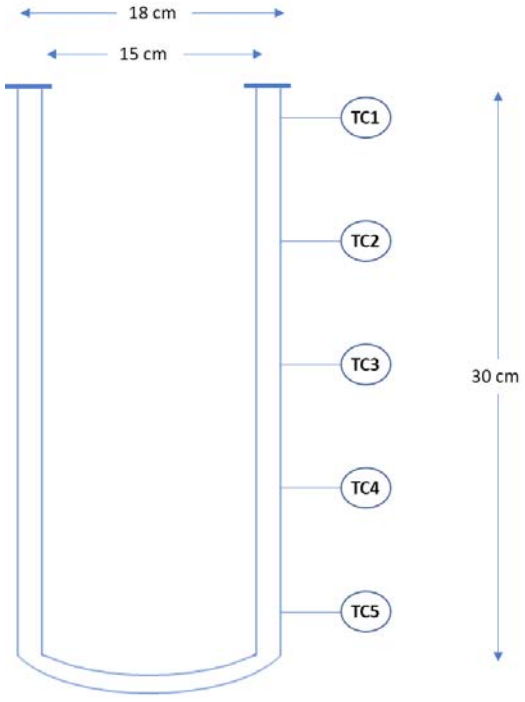

Figure 1 A: Glass tube with vacuum sealed end (with 10 ml water as working fluid)

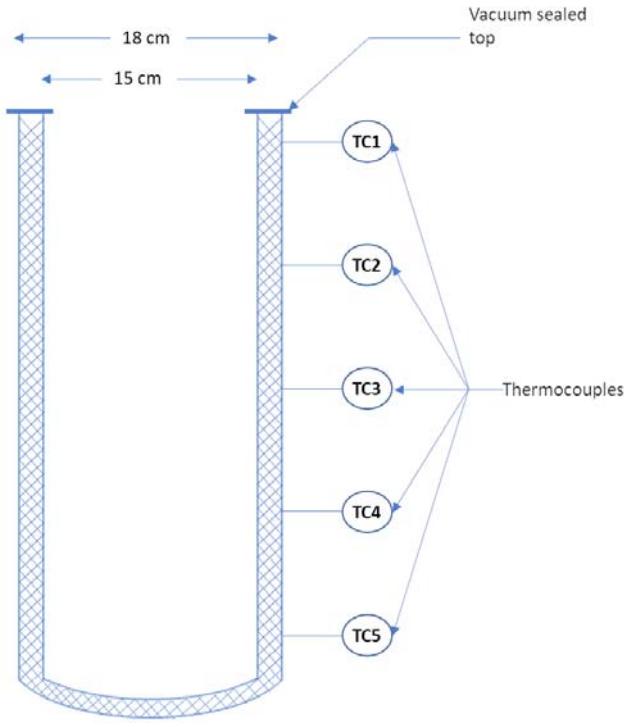

Figure 1 B: Vacuum sealed glass tube with SS mesh as heat pipe (with 10 ml water as working fluid)

Figure 2: PPicture of the experimental setup with heat pipe, thermocouples and heat bath

Experimental Description

In the experiments, we have compared heat pipe assembly with one without a heat pipe having no such arrangement as described it is a simple glass tube of similar dimensions. The heat pipe and the ordinary glass tube are kept in a water bath at a normal boiling point (about 100 ^{0}**C**).

The data are collected for temperature variation with time and reaching stability in temperature throughout the heat pipe tube.

Results and Discussion

When the temperature in the bath (using the Fluke heat source) was stabilized at 100 ^{0}**C**, the experimental tubes we submerged in the bath. To read the steady state temperatures, temperatures measured by thermocouples were recorded and tabulated in **Table 1** using a digital logger (after 15 minutes).

To study the dynamics of the temperature, the middle thermocouple (TC3), was observed for the first 15 minutes of keeping the setup in the bath. The results are tabulated in **Table 2**.

Table 1: Steady state temperatures in Heat Pipe and Glass tube (without Heat Pipe)

Thermocouple location	Temperature of Heat Pipe Assembly (^{0}C)	Temperature (Without Heat Pipe) ^{0}C
TC5	99.87	96.3
TC4	99.75	36.2
TC3	99.85	28.7
TC2	99.90	26.5
TC1	99.95	26.2

Table 2: Variation of temperature (TC3) with time in heat Pipe and Glass tube

Time (Min)	Temperature (Heat Pipe) (^{0}C)	Temperature (Without Heat Pipe) ^{0}C
1	35.64	33.25
3	65.42	38.50
6	74.96	35.44
9	96.38	35.48
12	99.95	35.50
15	99.96	35.55

From the results of the measurement, the heat pipe system is a better-conducting device. **Table 1** shows that the temperature measured by 5-thermocouples in the case of the heat pipe is much higher compared to the ordinary tube without the heat pipe.

In **Table 2** we measured temperature with respect to time variation and how it increases with time to reach the maximum temperature as set in the heating source. We see that it takes about 10 minutes to reach the steady state temperature from the time the setup was submerged in the hot water bath.

It is very clear that in the heat pipe assembly, there is effective heat transfer. The temperature becomes very stable and uniform.

However, in the case of a regular tube due to the low conductivity of glass, the temperature remains almost near the ambient with very little change of heat transfer seems to be effective.

Conclusions

The above study was to understand the effectiveness of a heat pipe system in the transfer of thermal energy. Even with relatively cheap materials and easy to manufacturing processes, effective heat pipes may be built which may have a variety of industrial applications.

Industrial Use

The laboratory experiment shows the heat pipe's immense potential around food processing Industries unit operation, where uniform heating is required.

In edible oil processing where quick and uniform heating and cooling is required for various unit operations, such as chilling for cold rooms, refrigeration, dry fraction (large amount of uniform cooling of water is required) maintain vacuum during bleaching operation and deodorization and cooling towers.

The scale up heat pipe devices shall be useful in reducing energy consumption in maintaining vacuum during deodorization and help in condensation of tocopherols and other important nutraceuticals from vapour phase. This will not only help in reducing the steam consumption but increase profitability of refining operation by condensing valuable nutraceuticals, which otherwise wasted in open condensation. This will also help in reducing clogging of cooling towers, thus will increase their efficiency, increase operation life, reduce maintenance, and reduce rate water replacement and top-up cycles.

The heat pipe device can also be useful in cooling final product from edible oil refineries, so that rate of increase of peroxide value is reduced and shelf life and keeping quality of refined oil is enhanced considerably.

Heat pipe can be instrumental in developing Plant, Machinery and Equipments for many unit operation in food industry.

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MEMBERS' PAGE

A Healthy Balance

by R.C. ARORA

Whenever on depression, the first thing is that a healthy, balanced diet is a great place to start. Also, in times of stress, people's good intentions about food go out of the window and they snack on whatever comes to hand, skip meals and generally don't pay much attention to what they are eating.

While there is no food that instantly make you feel better, however, a rich diet in whole foods - including a wide variety of fruits, vegetables, nuts, seeds, legumes and wholegrain breads and cereals - will certainly benefit your overall well-being.

Moreover, there are some particular nutrients and lifestyle activities that may be connected with depression. Equally, an important part of stabilizing health and to keep your blood sugar level stable , it is important to eat regularly, particularly breakfast taking care about how to eat and what you eat .

Affects of Foods and Emotional Eating on your mood -

In order for your brain to communicate with your body, it needs chemicals called neurotransmitters to conduct electrical impulses, or brain waves. Your body uses the enzymes, amino acids, minerals, proteins and carbohydrates in the foods. If you are not eating enough- or enough of the right foods - for your body to manufacture sufficient amounts of these chemicals, depression or anxiety can be result.

Avoid Emotional Eating -

Have you thought about why you are eating? There are a whole host of reasons, aside from hunger, that prompt people to eat - boredom, sadness, nervousness, anxiety, stress, even happiness. But if you look at what these things have in common, it's that they are emotions and not signals of your body's need for nourishment.

Highly beneficial nutrients for bringing the body back to balance, giving the body the power to reverse depression and stress include :

1. Complex carbohydrates in the form of fruits and vegetables which include carrot, beet, broccoli, cabbage, spinach, tomato, apple, orange, pineapple, cranberry, cherries and papaya.
2. Soybeans and soy products.
3. Beans, nuts, seeds, dried fruits.
4. Whole grains such as brown rice, millet, barley.
5. Increased intake of omega-3 oils may help with depression :omega -3 oils are an important component of the membranes of nerve cells. Studies have also shown that omega-3 fatty acids may also protect against cognitive deterioration. Omega-3 oils are found in deep - water fish (salmon, cod and sardines) and in nuts and seeds including walnuts, pumpkin and flax.
6. For sugar, use honey or cane sugar.
7. Minerals / vitamins - Folic acid, Calcium, Magnesium, Niacin, Vitamin D, B-vitamins - all are best derived from food.

Other Helpful Tips -

1. ***Eat regularly***. Sometimes it's difficult to eat when you are feeling low or with too tight a schedule. However, starving the body can increase anxiety.
2. ***Drink plenty of water each day*** - At least eight full glasses or more. Water is essential for energy and the functioning of the brain / body.
3. ***Creat - a relaxed atmosphere to eat*** - Stress decreases our body's ability to metabolise our food.
4. ***Eat your food slowly. Chew it properly.***
5. ***Don't discuss family matters and other issues when having a meal.***

Ref.: HT, Seema Hingoraney.

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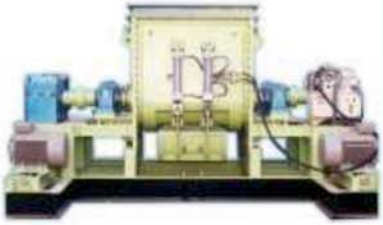

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