Review Article

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GLORIOUS UNREFINED PAST TO THE OBSESSED REFINING PRESENT OF EDIBLE OIL: A REVIEW

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ABSTRACT

Fat is an essential part of our diet. Healthy fats are needed for healthy living. Unlike other animals, humans have developed a reliance on oil as a source of energy and nutrition. Food oils or edible oils referred to as cooking oils are extensively used in all types of cuisine. But the choice of cooking oil has been the focus of intense debate from the past century. Numerous claims abound, each touting one cooking oil as superior to others. Oil is the heart of almost every Indian dish and the first ingredient that we reach for in the kitchen is oil. India has a diverse culture, when it comes to foods, different types of oil are used for cooking across India. Cooking oil differs according to the availability of natural sources, climate and the type and flavour of the dish. Selection of the healthy cooking oil is always important as it is an everyday ingredient. This article is an effort to understand the worth of unrefined cooking oil over refined cooking oil and to realize the hazardous health effects caused by refined oil consumption.

Keywords: Cooking Oil, Refined Oil, Unrefined Oil

INTRODUCTION

Food is considered as the primary need to each one of us. According to Ayurveda, Ahara is one among the Trayopastambha (three pillars of health). A proper selection of components needed for food preparation is always required to maintain a good health. In food preparations there are few things that is used in general, to increase the flavour, colour, taste or for better cooking purposes. A common ingredient that is used in almost all type of dishes is oil. Taila(oil) is commonly used for different cooking purposes like frying, favouring, garnishing etc. It forms an integral part of all Indian dishes and there are fewer chances that we can avoid oil in cooking. Therefore, right selection of edible oil is extremely important in the Indian context where the cooking methods are different than in the west.

When it comes to eating healthy it starts with what you are cooking with. The food health depends upon the quality and quantity of oil that we opt for cooking. Our options in the cooking oil have expanded dramatically over the last few years. With the endless choice available in the market and the advertisements that is put in front of the society brings us in a situation where it becomes difficult for us to choose.

This article is based on the review of literature from relevant Ayurvedic, modern and contemporary literary sources including the web sources, different journals and articles about the topic.

Growth and Advancement of Edible Oils

Looking in to the history the contemporary researches claims that it is as early as 2000 B.C that the Chinese and Japanese were the first ones to produce and consume oil for cooking purposes.[1] But the fact is that, Ayurveda classics which date beyond 5000 B.C have clearly explained about different types of oils and its properties. The references of variety of Taila are available in our classics with various Guna and Karma for cooking, few are listed below;

Table 1: Few Ahara-upayogi Taila listed in Ayurveda classics [2-5]

Bhava Prakasha	Charaka Samhitha	Susrutha Samhitha	Vagbhata
TilaTaila (Sesame oil)	Eranda Taila	Eranda Taila	Eranda Taila
Sarshapa Taila (Mustard oil)	Sarshapa Taila	Tila Taila	Narikela Taila
Kusumbha Taila (Safflower oil)	Tila Taila	Sarshapa taila	Sarshapa Taila
ErandaTaila (Castor oil)	Kusumba Taila	Kusumbha Taila	Tila Taila
Narikela Taila (Coconut oil)		Atasi Taila	
Atasi Taila (Flaxseed oil)			

So, we can consider Indians as the first ones to use oil for cooking and therapeutic purposes. According to the current scenario our country stands at the fourth position in the production of vegetable oil after U.S, Brazil and China, which harvests about 25 million tons of oil seeds in the world. Gradually people started refining this oil where the original oil was replaced with refined oils later. The consumption of refined cooking oil has increased dramatically over the past century.[6]

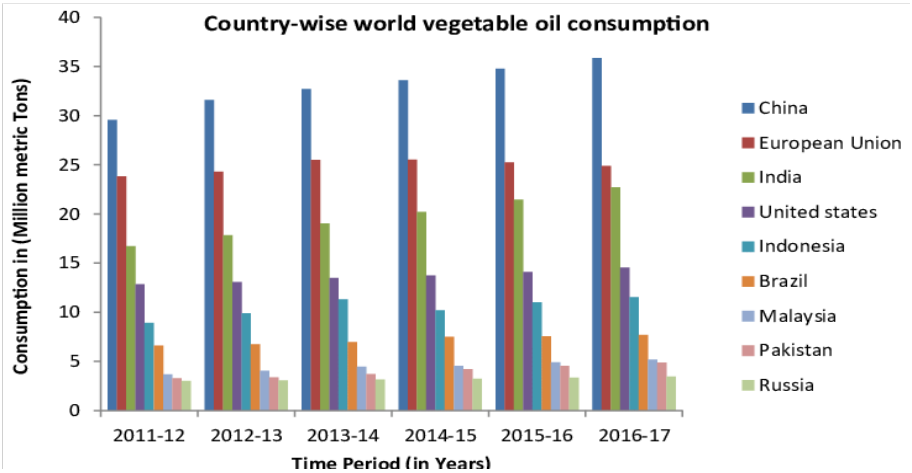

Figure 1: Country wise consumption of refined oil
Influence of Lifestyle, Nutrition and Obesity on Immune Response: A Global Issue - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Graph-showing-country-wise-world-vegetable-oil-consumption-10_fig2_313865607

This is a chart showing the level at which our country has reached in refined oil consumption. India stands at the third position from the year 2011 to 2017 and China occupies the first position in consuming the highest amount of refined cooking oil in recent years. According to the data of 2015 the most leading production of Palm oil is done by Indonesia and Malaysia together sharing a market of 84% with a reality that Indians are the highest consumers of this palm oil.[6]

According to 2024 review, the United States, consumed approximately 19.0 million barrels per day, China consumed 16.4 million, and India consumed 5.6 million. Other major consumers include Saudi Arabia, Russia, and Japan. [7]

Types of Oil

Oil is any non-polar chemical substance that is viscous liquid at ambient temperature and is both hydrophobic and lipophilic. There are mainly two sources of this oil:

- Mineral oil
- Organic oil

Under organic oil, the cooking oil or edible oil which is from plant, animal source, or synthetic fat can be used for different types of cooking. Oils are composed of several fatty acids grouped into classes namely:

- Monounsaturated
- Polyunsaturated
- Saturated fatty acid.

The consumable oil must contain balanced combination of these three groups of fatty acids. According to peoples need both unrefined oil and refined oil is available today. Oil which is not undergoing any of the refining processes is called as unrefined oil.

Unrefined Oil

They are usually referred as cold pressed or expeller pressed oil and are processed with minimal to no heat. Oil that we find as raw, pure, virgin etc. is all unrefined oil.

Extra virgin oil is the highest grade of oil; it is the cold pressed oil processed with minimal or no heat. It is considered first press of seed or fruit processed with minimal extraction. Lower the temperature oil is processed with; higher will be the quality and nutritional value of the oil extracted.

Virgin oil is the second press of the seed or fruit which is done with higher temperature when compared to extra virgin oil. The extra virgin oil or virgin oil has the natural flavour, colour, taste and properties in them. Since it is not undergoing any of the chemical processes or high temperature processing, it retains all the nutrients like vitamins, antioxidants lecithin, various plant sterols etc. in them. They are free from any of the harmful chemicals or preservatives which are used while refining oil.

Unrefined oil possesses more pronounced flavours, colours and fragrances than refined oil. They are lightly filtered which gives them a cloudy appearance and they are compromised with a high quality due to light purification process. Storage of the unrefined oil is also important. The unrefined cooking oils should be used as early as possible to reduce its rancidity. For maintaining the quality of flavour and nutrition, the oil must be stored in airtight glass containers in a cool, dark place. [8]

Refined Oil

When the oil is treated and when it undergoes many physical and chemical alterations at very high temperature, it forms the refined oil. There are two methods of refining.[9]

Methods of Refining

- Chemical refining
- Physical refining.

Under chemical refining mainly the free fatty acids (FFA) present in the oil is removed through a process called neutralization. An alkali is used to neutralize the FFA in the oil.

The chemical refining is done mainly under three steps[9,10,11]:

- Neutralizing
- Bleaching
- Deodorization.

Neutralization: First the seeds or fruits or nuts are taken and mechanical or chemical extraction is done with a chemical solvent called hexane/heptane. The oil is distilled at 150-degree Celsius temperature where it loses the natural proteins, fibre and minerals in it. Then the removal of phospholipids is done by eliminating the gums or mucilage, for that phosphoric acid is

added to remove the non-hydrated phospholipids. These are compounds that helps in the growth and functioning of plant cells. Along with the phospholipids the nutrients like calcium, magnesium, iron and proteins are being lost. A crucial lipid called lecithin is also lost. This process is called Degumming.

Later, Free Fatty Acid is removed by adding alkali solution (caustic soda, NaoH) through a process called neutralization. FFA is removed as soap stocks and washing is done to remove the gum, alkali solution and the stocks that are formed.

Washing and drying eliminates soap stocks, alkaline substances, residual metals, phospholipids and other impurities from the oil. The oil is pumped through a plate exchanger where it is heated by steam. It is sent to the centrifugal mixer to be combined with water. After this treatment water washed oil is dried with a vacuum dryer until moisture level of the oil falls. This is followed by bleaching[9-11].

Bleaching: It is a complex physical and chemical process with an objective to bleach the colour pigments. Fuller's earth, activated carbon, activated clay, special silica or minerals are used. All the minerals from carotene to vitamin A are lost here. The oil is sent to bleacher where it is thoroughly heated, dried and de-aerated in vacuum dryers.

Dewaxing/ winterization process is done for few oils rich with wax by heating the oil to make sure it is completely liquid, then the oil is cooled slowly. In chilled temperature, crystallization favours to separate wax from the oil. The filtration yields a clear liquid oil.

Deodorization: The last stage of refining process, de-acidification or deodorization is done to remove the altered smell of the oil which is impacted by the prior processes. In Deodorization steam distillation process is carried out at low pressure and elevated temperature of 180-220*c to remove the volatile compound mainly aldehydes, ketones (volatile component), contaminants, residual saturated and aromatic hydrocarbons in them. A chelating agent like citric acid is added to de-activate the trace materials that promote oxidation.[9,10,11]

Preservatives and antioxidants are added to boost the shelf life and enhance solubility. Hydrogenation is done where catalyst like nickel is used.

In physical refining the same steps are done, except for the alkali neutralization process. In this the FFA is removed through steam distillation[9-11].

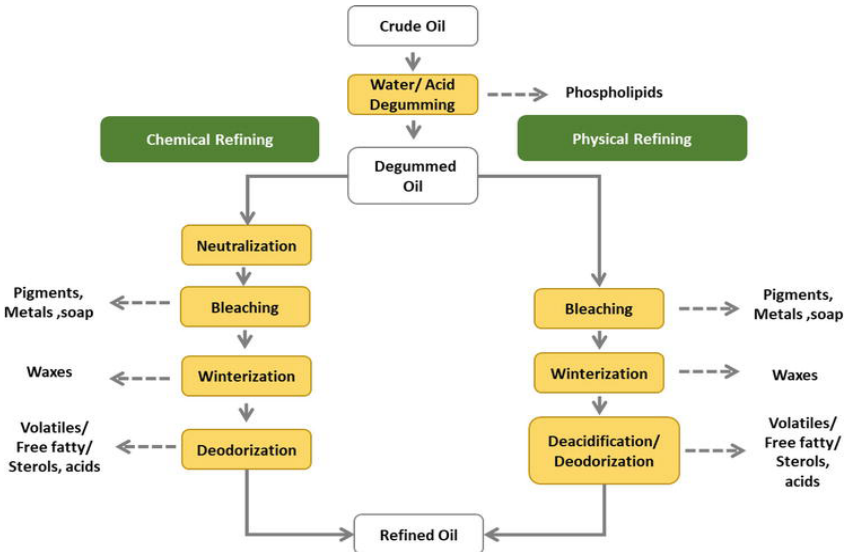

Figure 2: Basic steps of edible oil Refining
Sonawane A, Waghmode S. A Review on Vegetable Oil Refining: Process, Advances and Value Addition to Refining by-Products [Internet]. Environmental Sciences. Intech. Open; 2023. Available from: http://dx.doi.org/10.5772/intechopen.108752

The processes were started with a whole healthy oil, rich in all natural nutrients and healthy properties, ended up with a health degrading oil which has become thin and easy flowing with all chemicals and artificial contents in it.[11]

DISCUSSION

Refined oils involve sophisticated chemical and mechanical processes to extract oil from the seeds which removes all the natural nutrients from it and the final product formed oxidises early. These oils are more prone to form free radicles, which can lead to cancer conditions. Removal of the natural particles and resins makes the oil more stable and gives them a longer shelf life. There are many demerits of excess consumption of the chemically processed vegetable oils like; elevation in blood triglycerides, impaired insulin response, carcinogenicity and heart related diseases.[12]

Refined oils high in trans-fat

They are high in trans-fat. During the process of partial hydrogenation where the liquid UFA (unsaturated fatty acid) is converted into semi solid fatty acid by adding hydrogen, few UFA gets converted to trans-fat. Laboratory tests were conducted by CSE (Centre for Science and Environment) on 21 brands of vegetable oil available in Indian market and found out that trans-fat present in refined vegetable oils were 5-12 times higher than the recommended standards.[13] This trans-fat is known factors to trigger CVD, obesity, diabetes, prostate, colon, breast cancer and they inhibit enzymes that regulate blood flow.[14]

Refined oil made by a lot of processing

Refined oils are processed using high intense mechanical and chemical steps. They are heated many times to a high temperature and cooled down to low temperature. This results in degradation and generation of toxic substances. [9]

Lack of natural nutrients in the oil
The hard processes through which the oil is going through destroys all the nutrients, antioxidants, phytosterols, vitamins etc. and makes them devoid of natural things in it, making it unhealthy.[11]

Use of chemicals to increase the shelf life
They have a high smoke point and longer shelf life compared to unrefined oil. The chemical treatment makes them devoid of any organic life which leaves nothing to be spoilt in them. Smoke point is the temperature at which the oil starts smoking and produces toxic fumes with harmful free radicals. Various oils offer different smoking point due to the variation in the chemical properties. Among unrefined oil coconut oil/ghee is more stable during frying and their smoke point is comparatively high.[10]

Presence of 3-MCPD, 3-Monochloropropane, 1-2 DIOL
The 3-MCPD that are the Monochloropropane, 1-2 diols is a food processing contaminant included in the group of compounds known as Chloropropanols. In the recent year studies, it was reported that refined oils and fats are the major contributors of 3MCPD. In the year 2016 Department of food and nutrition reported that 3MCPD has a potential impact on human health and kidney is found to be the most targeted organ.[15]

Omega 6 and Omega 3 Ratio
Omega 3 and omega 6 are essential fatty acids that are needed for human health and development. The recommended ratio of omega 6: omega 3 is between 4:1 and 2:1. Unfortunately the processed refined oil has higher ratio of 20:1. It has been repeatedly proved that the high omega 6 fatty acid to omega 3 fatty acid content in refined edible oils are a greater concern in terms of causation of variety of diseases like insulin resistance, hyperlipidaemia, CVD, cancer, arthritis, Alzheimer's and increases inflammation response of the body. [16]

Additives and Preservatives
Refined oil is added with many emulsifiers, preservatives, colour flavours, synthetic form of vitamins, and artificial anti-oxidants which are not easy for our body to absorb and use. According to few data from the on-going studies it was found that the chemicals present in oil like nickel-based catalyst used for balancing pH, NaoH, the preservatives, citric and phosphoric acid can cause mutagenic actions and also lead to health problems related to digestive, respiratory and cardiovascular system. [14]

Indian cooking contexts differ greatly as the oils are subjected to high temperature heating and stir frying which are routine process in every curry or similar other preparation. During refining process, the oil is already subjected to high temperature at different levels.[17]

As a result, reheating the oil again to a high temperature during cooking can produce more toxic compounds that may potentially be mutagenic and atherogenic. Refined oils, particularly high in PUFA degrade easily and therefore should be avoided for frying.

By all these explanations we can understand refined oils are harmful and can cause serious health hazards due to its processing under many steps in high temperature with synthetic materials, chemicals and added preservatives in it whereas unrefined oil is healthy enough as it is least processed under minimal to no heat with natural nutrients in it.[18]

In recent days, the raw materials needed for making coconut oil are not available in sufficient quantity. But how does the companies or production units are able to produce sufficient amount of refined coconut oil to meet up the needs of this huge population?

The most suitable refined oil which is said to be healthy, of high quality and added nutrients processed under many steps with much effort costs less when compared to the unrefined oil which is made with least effort, why is it so?

These questions make us think about the purity of the refined oils what we are consuming daily.

Making right choices in food are always important for owing a healthy life. Preventing the unhealthy activities is the best way to avoid ill-health. Selection of the right oil is always important as it forms main part of our diet. [19]

Tila taila, Narikela taila, Bhuchanaka taila, Suryavalli taila, Sarshapa taila etc, ahara upayogi taila's are commonly being used. Oils are rich sources of essential fatty acids and fat-soluble vitamins like A, D, E and K. Choosing pure, natural oils and using them in moderation ensures good health and well-being. The oil can be chosen based on the Desha (locality) where we live. Each food is evolved with regard to what is suitable for the environment around us. The diversified culture of India offers different preference of cooking oil in different regions depending upon the availability of oils in that particular region. West Indians prefer groundnut oil while in East and Northern India mustard and rapeseed oils are used. In South India, Kerala, coconut oil is available abundantly due to the richness of coconut trees there, similarly sesame oil in Tamil Nadu etc. These oils are considered as the traditional oil where our forefathers were using them from long before. The oil which is available dominantly in our native is the one which can complement our body to cop-up with that environment where we live in and that oil is considered as the best suitable one for us.

Since each Desha will have its resources which are available enough, it is easy for us to do production of the oil needed for our cooking purpose in small scale level for self-consumption. We ourselves are the best one's for us to trust. So, it is better if we make effort to avoid the question in purity. Efficient refining processes with least possible damage should be developed to remove undesirable compounds from crude oil and by avoiding generation of unwanted compounds. This makes the processed oil safe for consumption.

Government should take strict rules and regulations to control the mal-practices related to the production of refined oil. Government officials should conduct periodic visits in the production centres which are necessary to find out the illegal practices and they should promote the usage of unrefined oil among the public.

People should be made aware about the health hazards produced by the refined oils. Awareness camps should be conducted by the health authorities and health consciousness must be created to make a healthy community.

Acharya's have mentioned about many Taila with different guna and karma like vrushya (aphrodisiac), brumhana (nourishing), preenana (soothing), chakshushy a(wholesome for eyes), pachana (digestive), garbhashaya shodhana (cleansing of uterus), balya (strength), medha agni vardhana (Lipotropic and strengthen digestive fire) etc. When we have naturally rich oil with many wonderful properties, why do we have to go behind the refined oil? Are we getting these natural benefits of this pure oil from the refined oil that we consume daily? Remember, oil is necessary for good health-but only when used wisely.

CONCLUSION

Most of the food habits have evolved with respect to the understanding that what is best for the environment you live in, which is the reason why we use different oils in distinct parts of the world. Looking into the history of health status of the people at past and present, it gives clarity that the refining activities in food sector have never helped us in developing a healthy community. Many new diseases started evolving due to the lifestyle that people lead. The everchanging modern lifestyle should be blamed for the way of bringing alteration in the food habits of people. If it is "traditional", it is bad and years later they come back to the tradition saying 'it is good'.
Recent studies have come up claiming the fact that, the unrefined oils with all natural factors in it are healthier compared to the refined oils.

Now it is up to us, to decide whether to go ahead blindly with the modern advertisements or to stick on to the richness of what we have at our home "The Way of Ayurveda"

Glorious unrefined past to obsessed refined present, so what will be the future?

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