

# Analysis of oxidative rancidity of different oil samples collected from Kalyan Taluka

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## ABSTRACT

Rancidity is the process which causes a substance to have unpleasant smell or taste. It is a biochemical reaction between fats and oxygen which causes oxidation of fats turning the substance rancid. There are three types of rancidity namely oxidative, ketonic, and hydrolytic rancidity. Consuming rancid substances may be slightly toxic and the harmful free radicals may cause cellular damage and digestive distress. In this analysis 30 samples were collected from different stores of KalyanTaluka and studied for oxidative rancidity using method prescribed by International Fragrance Association IFRA. The result showed oxidative rancidity values for 30 oil samples were between 0.11 to 1.66 mEq/Kg range which is considered under the lower oxidative rancidity range i.e.<10mEq/Kg. Mustard oil showed highest mean peroxide value i.e. 1.028 mEq/Kg followed by sunflower oil with 0.636 mEq/Kg. where as palm oil and Castor oil showed least peroxide values which was 0.13 mEq/ Kg. This study concluded that all oil samples collected from KalyanTaluka were less rancid and within permissible limit.

**Keywords:**Rancidity, oil, toxic, oxidation, fats

## I. INTRODUCTION

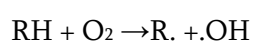
The term “lipid” has been frequently used as any of a group of organic compounds that are insoluble in water but soluble in organic solvents [1] Lipid is known as the collective name for fats, oils, waxes and fat-like molecules (such as steroids) found in the body [2]. It is found in the tissues of plants and animals and is broadly classified as: a) fats, b) phospholipids, c) sphingomyelins, d) waxes, and e) sterols. [3] Lipids are versatile biomolecules in living organisms performing various important functions like structural - element of biological membrane, hydrophobic anchor for proteins, “chaperones” to assist membrane folding ; chemical – cofactor for enzymes, electron carriers, light absorbing pigment; physical – amphipathic ,

hydrophobic barrier; chemical messenger – hormones and steroids[4],[5] . It also plays an important role in transport of biomolecules and delivering drugs and toxins across the biological membrane[6-8].Kauzelet. al. reported GlycosphingolipidGSLs Receptors from human colon epithelial cell lines Caco-2 and HCT-8 and ,determined the Shiga toxins (released by Stx-producing Escherichia coli) mediated cellular damage of Caco-2 and HCT-8 [9]. It is also an energy rich biomolecule. As per ICMR guidelines *Fats* are a concentrated source of energy providing 9 *Kcal/g*. [10]According to the Report of the Expert Group of the Indian Council of Medical Research recommend dietary allowances (RDA) of fat for Indian is between 15-30 %E [11].

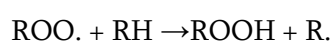
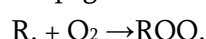
Report of Commodity Profile of Edible Oil for October – 2017 mentioned that production of edible oils in 2016-17 is 10.97 MT which is more than the actual production last year in 2015 -16 (i.e. 9.18 MT) while total import of edible oil is 12.63 MT [12] The global vegetable oil production for 2016/17 was 185.75 million metric tons [13].

Oils or fats are an important part of the diet of people across the world hence its quality is an important parameter and need to assess regularly. Factor which may affect the quality of oils or fats are impurities, oxidation during processing and storage via autoxidation and photosensitized oxidation, contamination with various microorganism, adulteration etc. [14-15] The oil may spoil because of rancidity. Rancidity is the process which causes a substance to have unpleasant smell or taste. The oxidation is responsible for decrease in nutritional and sensory quality of lipids like vegetable oils, animal fats, or even meat product etc. [16]. The degradation and reduction in shelf life of lipid are subjected to auto-oxidation, insufficient or improper storage [17]. There are three types of rancidity namely oxidative, ketonic, and hydrolytic rancidity. Oxidative rancidity involves oxygen attack of glycerides and subdued by careful choice and maintenance of oil [18]. When the unsaturated fats and oils breakdown it is because of their chemical structure and the reaction which takes place is called free radical chain reaction that abstracts the hydrogen from the fatty acid chain which is followed by reaction with oxygen causing rearrangements and cleavages and the end product being rancid oil or fat [18].

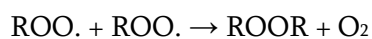
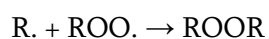
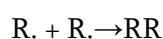
#### Initiation



Propagation



Termination



There are many chemical and physical methods that have been developed to determine the oxidative change in oils and fats [19]. The two most popular methods of indicating the quality of fats and oils are peroxide and thiobarbituric (TBA) value determination. The peroxide value of <2meq/kg considered to be low for fats and oils [20]. In India packed and unpacked oils and fats are sold in markets with predominance of sale of unpacked oils among the people below poverty line. Unpacked oils and fats may undergo rapid oxidation and the way it is handled, stored and hygienic practises also a matter of concern in many part of India.

The present study was carried out to check the peroxide rancidity of various edible and non-edible oils of Kalyan Taluka as it has a combination (loose and packed) of buyers for oils or fats.

## II. METHODS AND MATERIAL

30 packed and loose samples of fats and oils were collected randomly from various shops of Kalyan Taluka. Oxidative rancidity of fats and oils was determined as per the analytical modified method prescribed by International Fragrance Association (IFRA)[21]. 1g of sample oil or fat was taken into a clean dry 100ml beaker. To this sample 1g of powdered potassium iodide and 20 ml solvent mixture (2Glacial acetic acid: 1chloroform) was added. Beaker was placed in boiling water bath and allowed it to boil vigorously for 30 sec. The content was transferred quickly to a conical flask containing 20ml of 5%KI solution. 2-3 drops of starch indicator was added to the flask and titrated against N/500 sodium thiosulphate till blue colour disappears. The experiment was carried out in triplicate and mean reading was recorded.

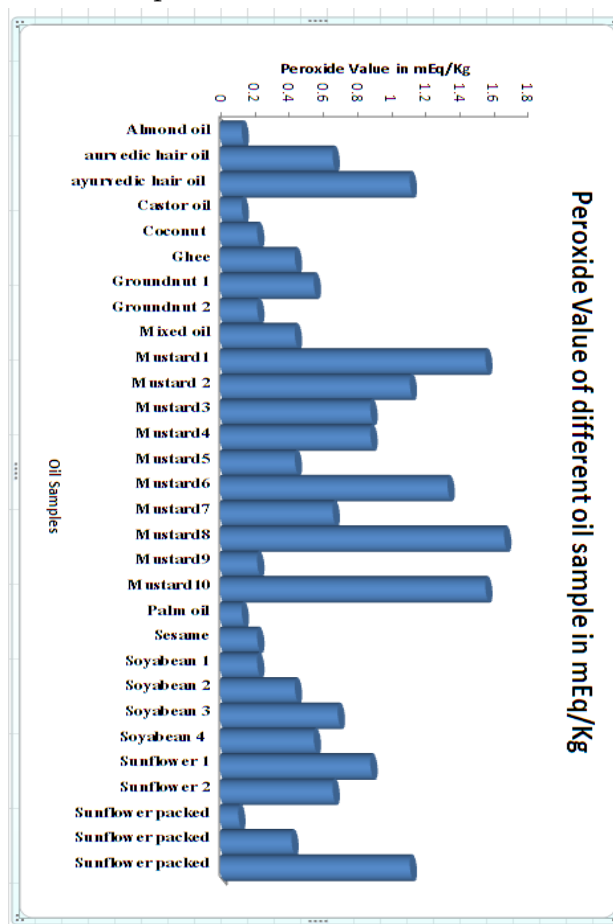
### III. RESULTS AND DISCUSSION

The results for the mean peroxide value of various oils and fats was showed in table no. 1. Mustard oil showed highest mean peroxide value i.e. 1.028 mEq/Kg followed by sunflower oil with 0.636 mEq/Kg. where as palm oil and Castor oil showed least peroxide values which was 0.13 mEq/ Kg. The peroxide values for non-edible hair oil was 0.885mEq/Kg which was also high. This experiment showed oxidative rancidity values for 30 oil samples were between 0.11 to 1.66 mEq/Kg. The mean peroxide value for all 30 samples was 0.426 mEq/Kg. The reason behind highest peroxide value for mustard oil because it was stored for longer time and less consumption since it is not used frequently in daily food preparation. The palm oil showed less rancidity because it is preferably used among poor community in this area and hence shelf storage of palm oil is shorter in as compared to mustard oil.

**Table 1.** Showing results for peroxide value of various oils/fats samples

Name of oil/ fat	Number of samples	Mean Peroxide Value mEq/Kg
Mustard	10	1.028
Sunflower	5	0.636
Soybean	4	0.475
Peanut	2	0.385
Ayurvedic hair oil	2	0.885
Almond	1	0.13
Castor	1	0.13
Coconut	1	0.22
Ghee	1	0.44
Palm	1	0.13
Sesame	1	0.22
Mixed oil	1	0.44
Total oil samples	30	Mean peroxide value =0.426

Figure showing results for peroxide value of various oils/fats samples



**Figure 1**

Rancid oil creates harmful free radicals in body which are associated with diabetes, Alzheimer's disease, Atherosclerosis and obesity. These free radicals are known to cause cellular damage. The rancidity of oil or fat reduces taste and odour, along with increased toxic levels of aldehydes, epoxides and hydroperoxides in body [22]. According to Dr. Andrew Weil rancidity can also cause damage to DNA, accelerate aging, promoting tissue degradation, and foster cancer development [23].

### IV. CONCLUSION

In this study all samples were found to be rancid as it has some peroxide value. The peroxide values for all samples remain in low range of peroxide value i.e. <10 mEq/ Kg. The study strongly recommends further

investigations on long term effect of use of less rancid oils on human health.

## V. ACKNOWLEDGEMENT

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