

# INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN CHEMISTRY AND PHARMACEUTICAL SCIENCES

(p-ISSN: 2348-5213; e-ISSN: 2348-5221)

[www.ijcreps.com](http://www.ijcreps.com)

(A Peer Reviewed, Referred, Indexed and Open Access Journal)

DOI: 10.22192/ijcreps

Coden: IJCROO(USA)

Volume 11, Issue 4- 2024

## Research Article



DOI: <http://dx.doi.org/10.22192/ijcreps.2024.11.04.001>

## Determination and comparison of peroxide value of cold press sunflower oil and refined sunflower oil

**A. Akash<sup>a</sup>, M. Kiruthiga<sup>b</sup>, S. Azhahendhiran<sup>a</sup>, S. Ayya Adhi<sup>a</sup>, K. Suridha<sup>a\*</sup>**

<sup>a\*</sup> Department of Chemistry, Poompuhar College (Autonomous), Melaiyur, Tamilnadu, India.

<sup>b</sup> Department of Chemistry, Government College for Women (Autonomous), Kumbakonam, Tamilnadu, India.

\*Corresponding Author e- mail id: [krhd944@gmail.com](mailto:krhd944@gmail.com)

### Abstract

The peroxides are the main initial products of oxidation, and the peroxide value is usually expressed in terms of milliequivalents of oxygen per kilogram of fat. Peroxide value determination gives a measure of the extent to which an oil sample has undergone primary oxidation. In this study, we addressed the effectiveness of antioxidants on the value of peroxide. Two samples of oil were prepared. The first sample contained cold press sunflower oil without any addition of antioxidants. The second sample contained refined sunflower oil purchased from markets. The study focused on the value of peroxide in two samples for about nine months, every fifteen days once the test was applied. Finally, the results from the experimental tests showed that the peroxide value of the first sample approximately reached the range (5.5–49.5 milliequivalents per kg of sample). Furthermore, the peroxide value of the second sample reached the range of 2–18.6 milliequivalents per kg of sample.

**Keywords:** Cold press sunflower oil, Refined sunflower oil, Peroxide value and antioxidants.

### 1. Introduction

The word oil is derived from the Latin word *oleum*, originally used for olive oil, but nowadays it means any of numerous combustible and unctuous substances that are liquid at room temperature (this distinguishes them from fats) and soluble in many organic solvents but not in water [1]. Vegetable oils are derived from plants and chemically are composed of triglycerides and several other minor

components, which may be very important for different aspects [2]. Lipids in general, and edible vegetable oils in particular, are very important in foods. They are, however, vulnerable to quality deterioration and must be adequately protected by packaging throughout their commercial life. Sources of edible vegetable oils are many and varied, and their quality attributes such as

nutritional properties, health benefits, lipid composition, odour, and colour are very important [3-5]. A precise knowledge of these attributes and their changes throughout the supply chain is required to guide shelf life testing and estimation. Oils are generally stable microbiologically due to very low moisture content. However, they are subject to important chemical and physical changes [6-8].

Cold Pressed sunflower oil, also known as "sunflower oil" is mostly used in cooking. Groundnut oil is rich in vitamin E, minerals and organic compounds. It has a very safe balance of fatty acids that can boost your health in a variety of ways. Oil is extracted via traditional cold pressing in wooden chekku or vats to retain the rich nutrients and flavour. Its nutty scent and powerful aroma infuses with the ingredients while cooking. With a high smoking point of 450 Degrees, it is a good choice for deep frying. sunflower oil contains monounsaturated fatty acids, like oleic acid, which increase the levels of "good cholesterol" called HDL in the blood [9-11].

Sunflower oil is commonly used as cooking oil, and it is also used in the food processing industry and non-food industries. Widespread usage brings along good quality necessities in all food items. The main aim of this study was to determine and compare the effects of the total antioxidant capacity, i.e., peroxide value, of cold press sunflower oil and refined sunflower oils sold in markets [12-13].

Two samples were prepared.

To assess the value of peroxide after 45 to 270 days of antioxidants in sunflower oil.

To investigate the effect of antioxidants on the peroxide value of refined sunflower oil over 45 to 270 days.

The present study focused on the value of peroxide in two samples for about nine months, every fifteen days once the test was applied.

## 2. Materials and Methods

### Collection of samples

The first material was purchased from cold-pressed oil (traditionally referred to as "Chekku"). Peanut seeds are made by first cleaning them and then the seeds are crushed in a rotary chekku for oil extraction. The extracted oil is filtered. Thus, the purchased product is designated as cold press sunflower oil. (Sample 1)

The second material was purchased from markets; it is named refined sunflower oil. (Sample 2)

### Chemicals and Reagents

1. Lipid (cooking oil can be used)
2. Acetic acid
3. Chloroform
4. Potassium iodide
5. Sodium thiosulfate
6. Starch

### Peroxide Value Test (PV)

Peroxide value (PV) is a measure of the peroxides contained in the oil. PV is determined by measuring the iodine released from potassium iodide. The American Oil Chemists' Society's (AOCS) Official Method Cd 8-53 is often used in determining the peroxide value of fats and oils [14]. Firstly, 2.5g of each sample was weighted into a 250-ml Erlenmeyer flask, and a 15-ml mixture of acetic acid and chloroform solution was added together in a proportion of 3:2. The solution was shaken before 0.5 ml of saturated KI was filled with it. KI solution was made by adding KI solute drop by drop to distilled water until it became saturated. Next, 15 ml of distilled water and 0.5 ml of starch indicator were mixed with the solution. A starch indicator was prepared by pouring 100 ml of hot distilled water into 2 g of starch. A saturated KI mixture is added to the sample, and the measure of iodine liberated from KI by the oxidative action of peroxides present in the oil is determined by titration with standard 0.1 N sodium thiosulfate using the starch solution as an indicator [15]. Titration was also performed for

blanks. The solution was titrated with 0.1 N sodium thiosulfate until the solution turned from oily yellow to colorless. All the samples were repeated in three replicates. Record the volume of sodium thiosulphate. The peroxide value was computed using the equation below:

$$\% \text{ PV} = \frac{S \times N \times 1000}{\text{Weight of the lipid}}$$

Where , S= mL of sodium thiosulfate and N= normality of the sodium thiosulfate.

### 3. Results and Discussion

A test on peroxide value (PV) was handed out to investigate the level of peroxide that occurred due to the lipid oxidation of used cooking oils. The American Oil Chemists' Society's (AOCS) Official Method Cd 8-53 is a common mode that has been used as an indicator of the initial stage of oxidative change. Figure 3.1 shows the peroxide value of cold press sunflower oil when compared with the 45th day to 270 days. Table 3.1 tabulated the data on the amount of milliequivalents of peroxide per gram of oil.

**Table 3.1 Peroxide value of cold press cooking oil**

PEROXIDE VALUE OF COOKING OIL	
DAY INTERVEL	PV OF COLD PRESS SUNFLOWER OIL
45 <sup>TH</sup> DAY	5.5
60 <sup>TH</sup> DAY	8.1
75 <sup>TH</sup> DAY	9.4
90 <sup>TH</sup> DAY	10.9
105 <sup>TH</sup> DAY	12.9
120 <sup>TH</sup> DAY	18.6
135 <sup>TH</sup> DAY	19.2
150 <sup>TH</sup> DAY	20.9
165 <sup>TH</sup> DAY	21.3
180 <sup>TH</sup> DAY	28.1
After 270 days	49.5

Table 3.1 showed that the peroxide value increased by a large amount of milliequivalents during the experimental tests, and the peroxide value of this sample approximately reached out of the range of the fresh oils. The absence of

antioxidants in fats and oils will cause several problems for their flavor and color, which will reduce their acceptable use. So, antioxidants are necessary to add to fats and oils to keep them natural and acceptable to use.

**Table 3.2 Peroxide value of refined sunflower oil**

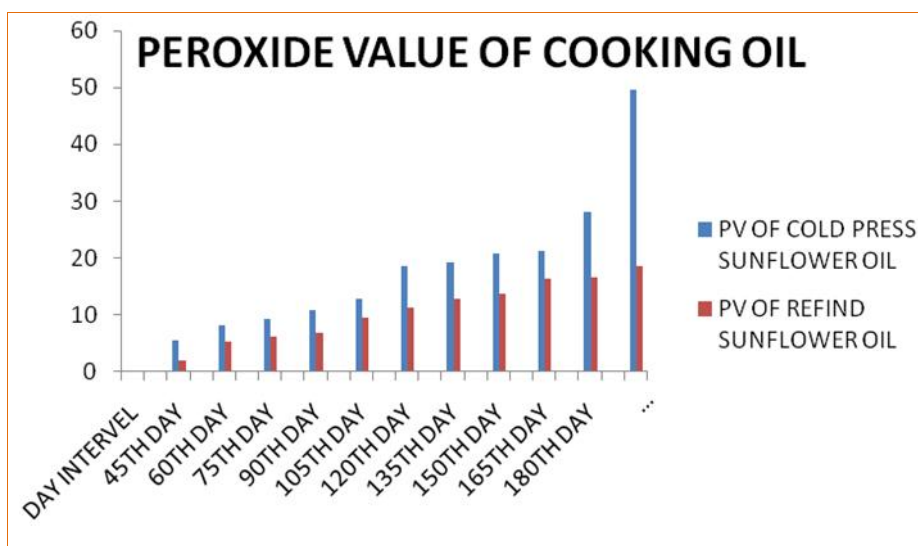
PEROXIDE VALUE OF COOKING OIL	
	PV OF REFINED SUNFLOWER OIL
45 <sup>TH</sup> DAY	2
60 <sup>TH</sup> DAY	5.4
75 <sup>TH</sup> DAY	6.1
90 <sup>TH</sup> DAY	6.9
105 <sup>TH</sup> DAY	9.5
120 <sup>TH</sup> DAY	11.4
135 <sup>TH</sup> DAY	12.8
150 <sup>TH</sup> DAY	13.8
165 <sup>TH</sup> DAY	16.3
180 <sup>TH</sup> DAY	16.5
270 DAYS	18.6

Table 3.2 shows the result of the second sample that was tested with an imported antioxidant. The effect of antioxidants on the stability of oil was assessed by measuring the increase in peroxide value. The low stability of the oil samples containing antioxidants gave a lower rate of increase in peroxide value compared to the cold press sunflower oil, which does not contain any antioxidants.

The rate of increase in peroxide value of the oil containing this antioxidant was also significantly lower. If we compare the two kinds of oil, the one prepared in the cold press sunflower oil and the other refined sunflower oil, we find a minor difference in the rate of increasing peroxide value, and the refined sunflower antioxidant is more active than the cold press sunflower oil. The maximum level for the peroxide value of edible fats and oils was established by the milliequivalents per kilogram of fats or oils. The rapid screening of the peroxide value of cooking oils should be applied to control the quality of

cooking oils. Cooking oil, used for frying several times or kept in an unsuitable environment such as in contact with air, heat, and light, causes deterioration, loss of nutritive value, and the production of toxic substances.

Tables 3.1 and 3.2 showed a value of peroxide, which started from sample 1 cold press sunflower oil (5.5 to 49.5) and refined sunflower oil (2 to 18.6), respectively. The measured value of peroxide in oil kept increasing after 270. The maximum level suggested by the FAO of the United Nations (2013) is up to 10 milliequivalents of active oxygen per kg of refined oil. The increase in peroxide value also suggested that the peroxide formed during the storage condition. Furthermore, the lipid hydroperoxide radical is formed when the heated oil is kept at room temperature and reused again in frying. They are parameters of standards for oil quality determination, such as the content of moisture, the content of free fatty acids, trace heavy metals, and the peroxide value.



**Figure 3.1 Peroxide Value of Cooking oil**

#### 4. Summary and Conclusion

Oil and fats are needed in our body as energy sources, as structural components, and to make powerful biological regulators [15]. They also play a vital role in metabolic reactions in the human organism. Basically, vegetable oils are beneficial and well accepted due to their cholesterol-lowering effect. However, compared with animal fats, which are mostly saturated and don't usually react with other chemicals like oxygen, unsaturated vegetable oils are more reactive [16].

Peroxide value (PV), along with free fatty acids, is one of the most frequently determined quality parameters during oil production, storage, and marketing. PV, often expressed as milliequivalents of hydroperoxide (ROOH) per kilogram of oil, is a measure of the hydroperoxides present in the oil as a product of primary oil oxidation. The first stage of the standard method includes the reaction of KI oxidation (at KI excess) by hydroperoxides in oils. The next stage is the volumetric titration, in which I<sub>3</sub> is liberated by Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> with the presence of a starch indicator. The iodine released is complexed with soluble starch, which acts as an indicator, and the iodine is quantitated by titration with sodium thiosulfate. Based on the stoichiometry of the two reactions, the hydroperoxide concentration can be calculated.

Refined oil is better than cold press oil because cold press oil cannot be used for a long time. It often produces a product with a longer shelf life, a lower smoke point, and fewer particles.

The present study suggested that when choosing oil, the cold press sunflower oil (Chekku) should not be used for a long time. The peroxide value is high. Refined oil has a longer shelf life as it is chemically treated. There is nothing to spoil in it, as there is no organic life in it.

#### References

- [1]. D. Frank, Ed. Gunstone, Vegetable Oils in Food Technology: Composition, Properties and Uses. 2011.
- [2]. E.M. Force, Sunflower: Chemistry, Production, Processing, and Utilization AOCSS Press. 2015.
- [3]. H.-D. Belitz, W. Grosch, P. Schieberle, Food Chemistry 4th revised and extended ed. 2009. [4] M. Kayahan, Ya lı Tohumlardan Ham Ya ÜretimTehnolojisi. TMMOB Gıda Mühendisleri Odası, Ankara. 2006.
- [4]. A. A.-Gotor, M. Berger, F. Labalette, S. Centis, J. Daydé, A. Calmon, "Oleic conversion effect on the tocopherol and phytosterol contents in sunflower oil," Int. J. Exp. Bot., 83 (2014) 319–324.

- [5]. S. Naz, S.T.H. Sherazi, F.N. Talpur, Changes of Total Tocopherol and Tocopherol Species During Sunflower Oil Processing, *J. Am. Oil Chem. Soc.*, 88 (2011)127–132.
- [6]. K. Ratusz, E. Popis, H. C.- ytkiewicz, and M. Wroniak, Oxidative stability of camelina (*Camelina sativa* L.) oil using pressure differential scanning calorimetry and Rancimat method, *J. Therm. Anal. Calorim.*, 126 (2016) 343–351.
- [7]. R.D.O'Brien, *Fats and Oils: Formulating and Processing for Applications*, Second Edition, CRC Press LLC. Florida. 2004.
- [8]. Q. Liu, D. Li, W. Wang, D. Wang, X. Meng, and Y. Wang, Chemical Composition and Antioxidant Activity of Essential Oils and Methanol Extracts of Different Parts from *Juniperus rigida* Siebold & Zucc., *Chem Biodivers*, 13 (2016) 1240–1250.
- [9]. C. Janu, D.R.S. Kumar, M.V. Reshma, P. Jayamurthy, A. Sundaresan, and P. Nisha, Comparative study on the total phenolic content and radical scavenging activity of common edible vegetable oils, *J. Food Biochem.*, 38 (2014) 38–49.
- [10]. Yanai H, Katsuyama H, Hamasaki H, et al. (2015). "Effects of Dietary Fat Intake on HDL Metabolism". *J Clin Med Res*. 7 (3): 145–9. doi:10.14740/jocmr2030w. PMC 4285059.PMID 25584098.
- [11]. Clarke, R; Frost, C; Collins, R; et al. (1997). "Dietary lipids and blood cholesterol: quantitative meta-analysis of metabolic ward studies". *BMJ*. 314 (7074): 112–7. doi:10.1136/bmj.314.7074.112. PMC 2125600.PMID 9006469.
- [12]. Jinfeng Pan, Huixing Shen, Juan You and Yongkang Luo, Changes in physiochemical properties of Myofibrillar protein from Silver Carp (*Hypophthalmichthys molitrix*) during heat treatment. *J. Food Biochem.*, 35 (2011), pp. 939-952.
- [13]. Jayadeep Vijayan, David C. Slaughter, R. Paul Singh, Optical properties of corn oil during frying, *Int. J. Food Sci. Technol.*, 31 (1996), pp. 353-358.
- [14]. R. Bou, J.A. Navas, A. Tres, R. Codony, F. Guardiola, Quality assessment of frying fats and fried snacks during continuous deep-fat frying at different large-scale producer, *Food Control*, Volume 27, Issue 1, September 2012, Pages 254-267.
- [15]. Atanu B. Bhattacharya, M.G. Sajilata, Sudha R. Tiwari, Sudha R. Tiwari and Rekha Satishchandra Singhal, Regeneration of thermally polymerized frying oils with adsorbents, *Food Chemistry* 110(3):562-570.
- [16]. Zhang, Q.; Saleh, A.S.M; Chen, J. and Shen, Q. (2012) Chemical alterations taken place during deep-fat frying based on certain reaction products: A review. *Chemistry and Physics of Lipids*, 165: 662-681.

Access this Article in Online	
	Website: <a href="http://www.ijcrcps.com">www.ijcrcps.com</a>
	Subject: Chemistry
Quick Response Code	
DOI: <a href="https://doi.org/10.22192/ijcrcps.2024.11.04.001">10.22192/ijcrcps.2024.11.04.001</a>	

How to cite this article:

A. Akash, M.Kiruthiga, S. Azhahendhiran, S. Ayya Adhi, K. Suridha. (2024). Determination and comparison of peroxide value of cold press sunflower oil and refiend sunflower oil. *Int. J. Curr. Res. Chem. Pharm. Sci.* 11(4): 1-6. DOI: <http://dx.doi.org/10.22192/ijcrcps.2024.11.04.001>