IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Comparative study of physicochemical properties of cold-pressed groundnut oil and refined groundnut oil from well-known brands in Bengaluru

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Abstract: Groundnut oil is widely used in India since time immemorial since it is tasty, has good nutritive value and is affordable. Groundnut oil is extracted by cold pressed (traditional)method or by Refined method (modern).

The cold pressed method involves crushing nuts and forcing oil under pressure without use of much chemicals and without generation of too much heat. It is claimed that this method of oil extraction does not cause loss of nutrition in the extraction process. This increases the cost of oil, as less oil can be extracted from the nuts by this method.

The refined oil method uses high temperature and chemicals for oil extraction, which is said to strip oil of many nutrients. More oil can be extracted by this method and so, decreases the cost of oil.

This paper compares various physicochemical properties of cold pressed and refined ground nut oil of popular brands available in Bengaluru city to find out which method of oil extraction is beneficial for health. Acid value, Iodine value, Peroxide value, Antioxidant activity were some of the parameters evaluated for comparison.

Key words: Groundnut oil, Cold pressed, Refined, Physicochemical properties, Comparison

I. INTRODUCTION

Groundnut (*Arachishypogaea*) is one of the major oilseeds of India and a very important food crop most widely used for its nutrition, taste, and as a functional food due to its role in the health-promoting effect. Groundnut oils contain lipids and usually a mixture of triglycerides and fatty acids, the essential fatty acids include linoleic acid, oleic acid, and linolenic acid.(**Error! Reference source not found.**Oil extracted from groundnuts are rich in fatty acids, sterols, antioxidants, monounsaturated (MUFA), and polyunsaturated fats (PUFA), and is a great source of vitamin E(**Error! Reference source not found.**.Groundnut oil has a wide range of health benefits in improving blood flow and heart health, helps in lowering high blood pressure and maintaining low cholesterol levels, in aromatherapy, and various other dermatological uses (**Error! Reference source not found.**.Groundnut oil is also a source of valuable resveratrol, which neutralize the harmful free radicals, and stresses and maintains cell membrane integrity.Groundnut is considered "The King of Oil Seeds", "Wonder nut" and "Poor Men's Cashew nut"as it is a low-priced commodity with a source of all valuable nutrients.Groundnut oils are widely used for cooking in India since it has good nutritive value and is affordable. Groundnut oils are extracted using different processes of which two main processes are:

i. Cold-pressed method of oil extraction
ii. Refined method of oil extraction

Cold-pressed method of oil extraction

The cold-pressed method is an ancient, traditional method where the oil is extracted from groundnuts using a temperature-controlled expeller i.e., Ghani. This process involves crushing nuts and forcing out the oil under high pressure without the generation of too much heat. Since cold-pressed oils are unrefined and minimally processed, they have a shorter shelf-life and produce a lower yield(**Error! Reference source not found.**. The oil has its natural yellow color and is opaque with a thick consistency. It is claimed that this helps to retain the genuine flavor, taste, and nutritional quality of the oil(**Error! Reference source not found.**.

Refined method of oil extraction

The refined method is a modern technique of oil extraction where 100% oil is extracted from groundnuts using chemicals and heated at a very high temperature. In this process, the oils are neutralized (acidity balanced), bleached (stripped of colour), and deodorized (devoid of its natural aroma) making the oil transparent and very thin in its consistency(**Error! Reference source not found.**. Chemicals like Phosphoric acid and calcium hypochlorite are added to increase the shelf-life and yield capacity of the oil which in turn affects not only the flavor and aroma but also strips the oil of many of its nutritive values(**Error! Reference source not found.**. Cold pressing is more expensive as it takes longer time and produces lower yields(less oil more groundnut residue) – but it is claimed as the safest, most natural extraction method (**Error! Reference source not found.**, whereas in the refined method, the oil is extracted in bulk quantities and yields almost 100% of the oil. Since more oil is extracted, it is comparatively cheaper. When the cost of production is high then the product cost is also high.

II. OBJECTIVE

The objective of this project is to evaluate a comparative study between refined groundnut oil(Gold winner brand) and cold-pressed groundnut oil(Hita brand)obtained from stores in Bengaluru in terms of the various physicochemical properties such as Acid value, Iodine value, Peroxide value, Antioxidant activity, Saponification value, etc. and test for adulteration(Argemone oil test). These will give a fair idea to find out whether the oil extracted through the crude process (Cold-pressed method) or refined process (heat-pressed method) is beneficial for health.

SAMPLES USED

Sample 1.Cold-pressed Groundnut Oil price: Rs.350 for 1L.

Brand Claims (On the Pouch): - Cold-Pressed Groundnut Oil is extracted through a natural process by pressing the nuts and seeds without the use of high temperature or artificial refining agents. As this is naturally extracted at room temperature, it retains all nutrients and flavor.

Sample 2. Refined Groundnut Oil price: Rs.160 for 1L.

Brand Claims (On the pouch): - Gold Winner Refined Groundnut oil is extremely light and pure cooking oil with a composition of fatty acids. The stringent refining process produces oil that helps in keeping sweets and savories fresh, crispy, and crunchy. No wonder, it is the natural and first choice for the gourmets of tasty and healthy food.

III. PARAMETERS

1.0 ACID VALUE

The acid value is an important parameter that indicates the degree of rancidity of the oil. The acid value is defined as the number of milligrams of potassium hydroxide or Sodium hydroxide required to neutralize the free fatty acids present in 1g of oil. It is a relative measure of the rancidity of oil.

1.1 ACID VALUE DETERMINATION:

The Acid Value for oil samples was evaluated by titration method based on IS 1548 (Part I) -1964.
The Acid value is determined by weighing the samples accurately in a conical flask. 60ml of freshly neutralized alcohol and a milliliter of phenolphthalein indicator solution are added to the samples. The mixture is boiled for 5 minutes and is directly titrated while hot, against 0.01N standard sodium hydroxide solution until the sample turns from colorless to pale pink indicating the endpoint. The volume of NaOH run down from the burette is noted.

The Acid value was calculated using the formula:

$$\frac{40.0 \times Normality\ of\ NaOH\ \times Volume\ of\ NaOH\ run\ down}{Weight\ of\ sample}$$

1.2 CALCULATION:

- The acid value of cold-pressed groundnut oil

  $\frac{40.0\times0.1\times1.9}{2.04} = \mathbf{3.725mg}$ of NaOH to neutralise 1g of oil

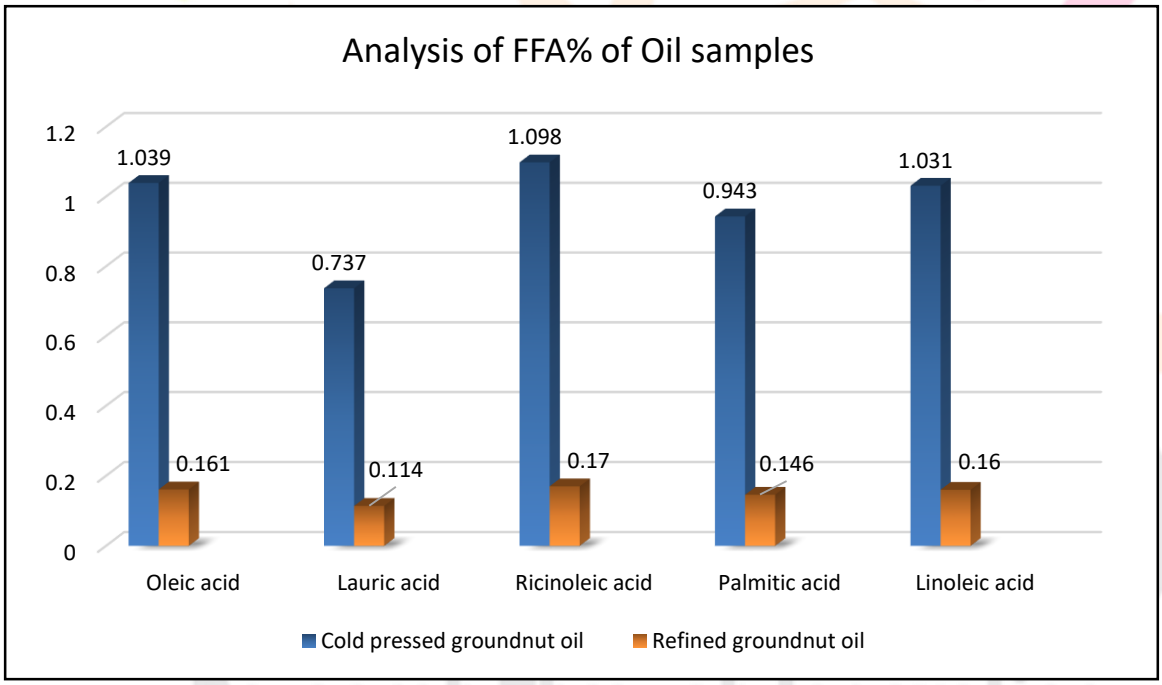
- The acid value of refined groundnut oil

  $\frac{40.0\times0.001\times0.1}{2.03} = \mathbf{1.576mg}$ of NaOH to neutralise 1g of oil

1.3 OBSERVATION:

Table 1 : Acid Value of groundnut oils

SAMPLE	**ACID VALUE** (mg of NaOH to neutralise 1g of oil)
COLD-PRESSED GROUNDNUT OIL	3.725
REFINED GROUNDNUT OIL	1.576



Graph 1 : FREE FATTY ACID% OF GROUNDNUT OIL SAMPLES

1.4 DISCUSSION:FFA% in cold-pressed groundnut oil is more than the refined groundnut oil. Acid value should not be more than 6 as per FSSAI.

2.0 IODINE VALUE

The Iodine value is a measure of the amount of unsaturation, which is the most important analytical characteristic of oil.
The iodine value of oil is the number of grams of iodine consumed by 100 grams of oil.
It is of major interest regarding the oxidative stability of oils.

2.1 DETERMINATION OF IODINE VALUE:

The Iodine Value for oil samples was determined by titration method based on
IS 1548 (Part I) -1964.
The Iodine value is determined by weighing the samples accurately in a conical flask. Chloroform and Wij's solution of 25ml each were added to the samples and mixed well. The mixture is kept in dark for an hour for the reaction to occur. A blank is carried out simultaneously. 15ml of Potassium iodide is added and titrated against 0.1N Standard sodium thiosulphate solution ($Na_2S_2O_3 \cdot 5H_2O$)using starch as an indicator. The disappearance of the blue color indicates the endpoint. Blanks and determinations must be made at the same time.

The Iodine Value is calculated using the formula,

$$\frac{12.69\ (Volume\ of\ Std\ Na^2S^2O^3 \cdot 5H^2O \text{required for blank} - \text{Volume of Std } Na^2S^2O^3 \cdot 5H^2O \text{required for sample}) \text{ Normality of Std } Na_2S_2O_3 \cdot 5H_2O}{Weight\ of\ sample}$$

2.2 CALCULATION:

- Iodine value of cold-pressed groundnut oil

$$\frac{12.69\ (39.9 - 13.8)\ 0.1}{0.3667} = \mathbf{90.3215}\text{g of Iodine consumed / 100g oil}$$

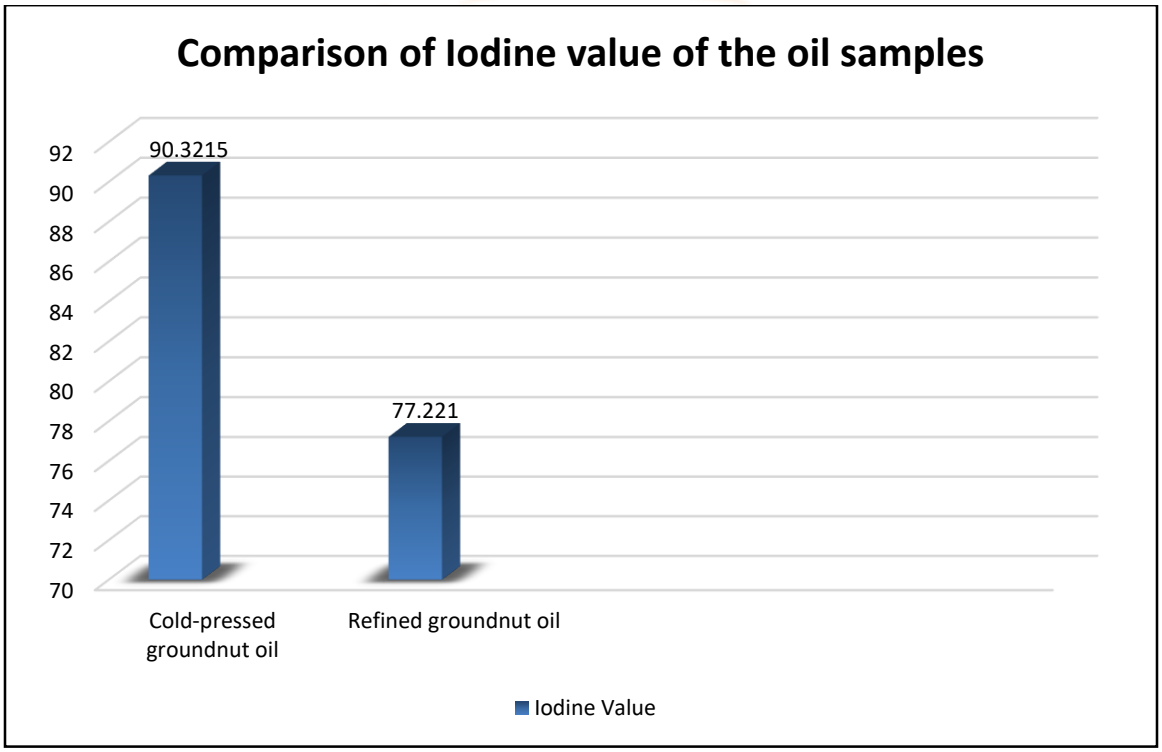
- Iodine value of refined groundnut oil

$$\frac{12.69\ (39.9 - 21.9)\ 0.1}{0.2958} = \mathbf{77.2210}\text{g of Iodine consumed / 100g oil}$$

2.3 OBSERVATION:

Table 2 : Iodine value of groundnut oils

SAMPLE	**IODINE VALUE** (g of Iodine consumed / 100g oil)
COLD-PRESSED GROUNDNUT OIL	90.3215
REFINED GROUNDNUT OIL	77.2210



Graph 2 : IODINE VALUE OF GROUNDNUT OIL SAMPLES

2.4 DISCUSSION: The iodine value of Cold-pressed groundnut oil is greater than refined groundnut oil which indicates that the cold-pressed groundnut oil has more unsaturated fatty acids than refined groundnut oil. The expected iodine value of oil samples should not exceed 84-100g of I_2/100g as per FSSAI.

3.0 PEROXIDE VALUE

The peroxide value is an important parameter to assess the quality of the oil. It provides quantitative information about the presence of peroxides (primary oxidation products) which are formed when unsaturated fatty acids in oils react with oxygen.
The peroxide value is defined as the reactive oxygen contents expressed in terms of milliequivalent (meq) of free iodine per kilogram of oil.

3.1 DETERMINATION OF PEROXIDE VALUE:

The Peroxide Value for oil samples was determined by titration method based on IS 1548 (Part I) -1964.The Peroxide value is determined by weighing the samples accurately in a conical flask. A mixture of acetic acid and chloroform is mixed in a ratio of 3:1. 30ml of this mixture is added to the samples. Then, 0.5ml of saturated potassium iodide solution is added, after a minute of occasional shaking, 30ml of distilled water is added to the samples. This mixture is titrated against 0.01N Sodium thiosulphate solution with constant shaking until the yellow colour almost disappears. 0.5ml of Starch solution is added as an indicator at this point and is titrated until the blue colour disappears. A blank determination is conducted in the same way. The volume of sodium thiosulphate solution run down is noted.

The Peroxide value was calculated using the formula,

$$\frac{(\text{Volume of Std. } Na2S2O3.5H2O \text{ for sample} - \text{Volume of Std. } Na2S2O3.5H2O \text{ for blank}) \times \text{Normality of } Na2S2O3.5H2O \times 1000}{Weight\ of\ sample}$$

3.2 CALCULATION:

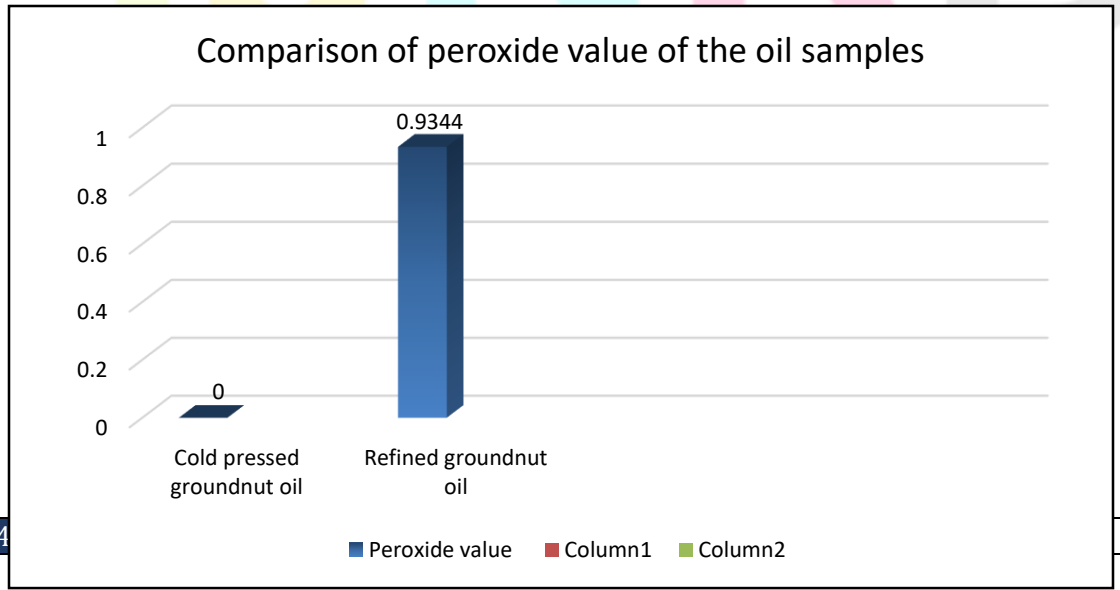
- Peroxide value of cold-pressed groundnut oil - after adding the starch indicator to cold-pressed groundnut oil, no blue coloration appeared. Therefore the value is considered **nil**.
- Peroxide value of refined groundnut oil

$$\frac{(0.5 - 0)\ 0.01 \times 1000}{5.3508} = \mathbf{0.9344} \text{meq of active oxygen/kg oil}$$

3.3 OBSERVATION:

Table 3 : Peroxide Value of groundnut oil samples

SAMPLE	PEROXIDE VALUE (meq of active oxygen/kg oil)
COLD-PRESSED GROUNDNUT OIL	0
REFINED GROUNDNUT OIL	0.9344



Graph 3 : PEROXIDE VALUE OF GROUNDNUT OIL SAMPLES

3.4 DISCUSSION: The peroxide value of refined groundnut oil is slightly higher than cold-pressed groundnut oil. Even though from the graph the peroxide value seems to be more, there is no significant difference in the peroxide value. According to FSSAI the PV value should be less than 10meq of active oxygen/kg oil for it to be significant.

4.0 ANTIOXIDANT ACTIVITY

Antioxidants are chemical substances that neutralize free radicals. They can prevent damage to the body cells and protect the lipids, proteins, and nucleic acids from oxidative damage or repair damage that has already been done by free radicals. Free radicals are generated by the body during normal metabolism.

4.1 DETERMINATION OF ANTIOXIDANT ACTIVITY: The antioxidant activity of refined groundnut oil and cold-pressed groundnut oil is determined using the DPPH method.

4.1.1 DPPH assay- The DPPH is a stable free-radical molecule that has an unpaired electron and is soluble in methanol characterized by its deep-violet colour with an absorption maximum at 517 nm.
The use of 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) is to test the ability of compounds to act as free radical scavengers or proton plus electron donors and to evaluate the antioxidant activity of the oil. Antioxidants can react with this stable DPPH radical by providing an electron or hydrogen atom, thus reducing it to 2, 2-diphenyl-1-hydrazine (DPPH-H) which is characterized by the change in color intensity which is easily monitored with a spectrophotometer.

4.2 Preparation of samples:

Different volumes of both refined oil and cold-pressed groundnut oil ranging from 50 - 250µL were made up to 1mL with methanol. These samples were vortexed thoroughly and left overnight in the refrigerator.

4.2.1 Procedure:

The free radical scavenging capacity of the extracts from different oil samples was estimated using the stable DPPH radical. About 100 µL of different concentrations of both the oils were taken in the different test tubes.
To all the test tubes, 3mL of DPPH solution (whose absorbance was noted down before usage) was added and incubated in dark conditions for 15minutes.
After incubation, the absorbance was read at 517nm spectrophotometrically with methanol as a blank. Percentage inhibition was calculated using the formula.

Percentage of inhibition of DPPH radicals,

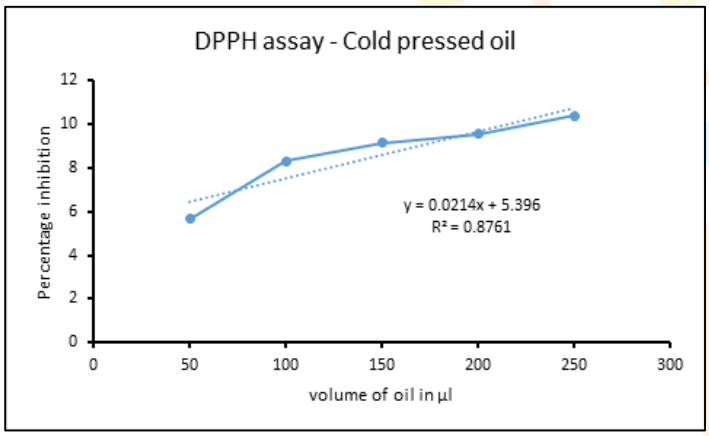
$$\frac{\text{Absorption of control} - \text{absorption of sample} \times 100}{\text{Absorption of control}}$$

4.3 OBSERVATION:

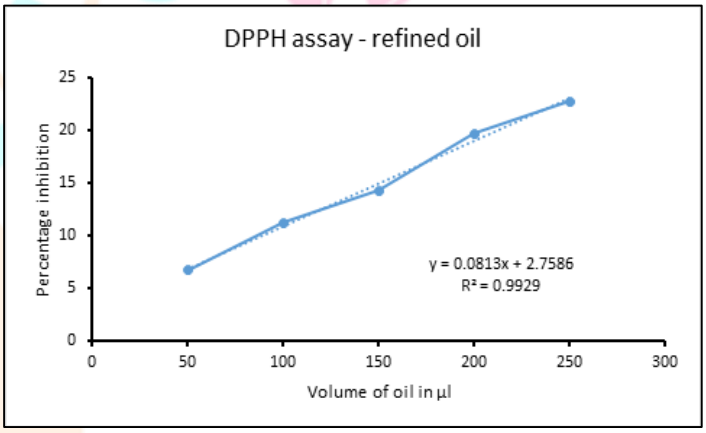
Table 4 : DPPH assay of groundnut oil samples

Volume of sample (µl)	Absorbance at 517 nm		Percentage inhibition	
	Refined oil	Cold pressed oil	Refined oil	Cold pressed oil
50	0.888	0.898	6.722	5.67
100	0.845	0.873	11.23	8.29
150	0.816	0.865	14.28	9.13

200	**0.764**	**0.861**	**19.74**	**9.55**
250	**0.735**	**0.853**	**22.79**	**10.39**



Graph 5. DPPH Assay of Cold pressed Groundnut oil sample

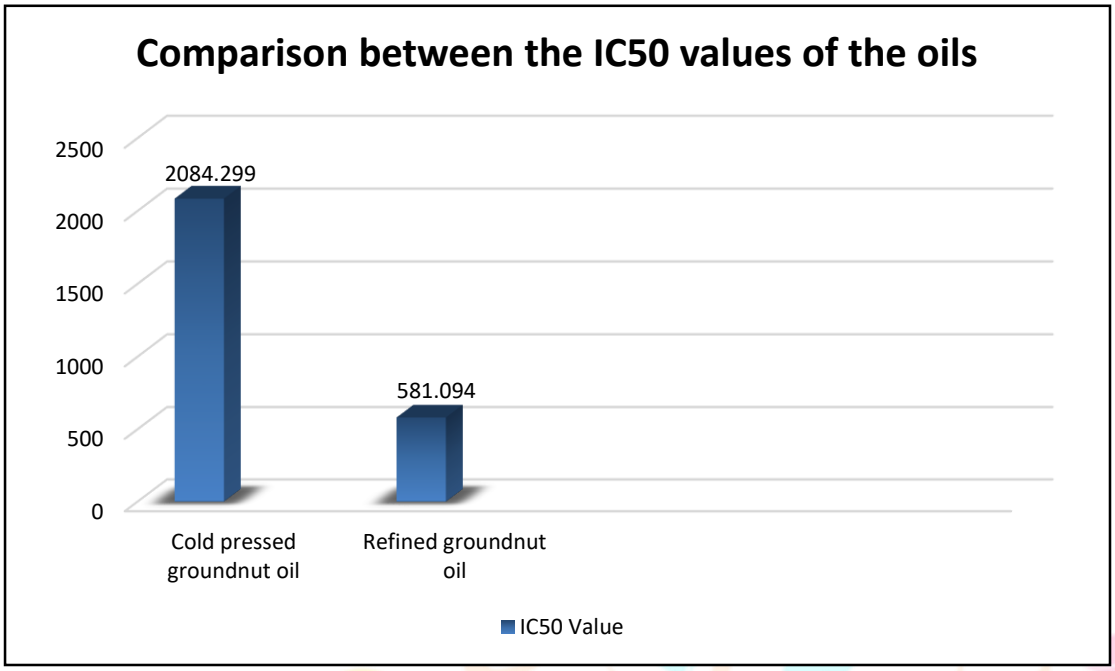


Graph 6: DPPH assay of refined groundnut oil sample

A graph was plotted using the volume of the sample oil against percentage inhibition. Using the straight-line equation obtained from the graph, the IC_{50} value was calculated.IC_{50} (Half maximal Inhibitory Concentration) value is the concentration of the sample that can scavenge 50% of DPPH free radical. The IC_{50} value is inversely proportional to the free radical scavenging activity/antioxidant property of the sample. A smaller IC_{50} means higher antioxidant activity.

Table 5 : IC_{50} value of groundnut oil samples

SAMPLE	IC_{50} value (µL)
COLD-PRESSED GROUNDNUT OIL	2084.299
REFINED GROUNDNUT OIL	581.075



Graph 4 : IC_{50} VALUES OF GROUNDNUT OIL SAMPLES

4.4 DISCUSSION: The IC_{50} value of refined groundnut oil is lesser than cold-pressed groundnut oil which indicates that refined groundnut oil has higher antioxidant activity.

5.0 SAPONIFICATION VALUE

The saponification value is an important parameter used for the characterization and assessment of the quality of oils.
It is defined as the number of milligrams of potassium hydroxide required to saponify one gram of oil. The saponification number provides information about the average molecular weight of all fatty acids present in the oil.

5.1 DETERMINATION OF SAPONIFICATION VALUE:

The Saponification Value for oil samples was determined by titration method based on
IS 1548 (Part I) -1964.
The saponification value is determined by weighing the sample accurately in a conical flask. The flask is connected to the reflux air condenser with 25ml of alcoholic potassium hydroxide solution in it and is heated in a water bath for 45 minutes. It is boiled until the sample is completely saponified and a clear solution appears. After the condenser has cooled, 10ml of neutralized alcohol is added to wash down the inside of the condenser, and 1ml of phenolphthalein indicator solution is added and titrated against 0.5N standard hydrochloric acid with endpoint indicating colourless solution. A Blank titration is prepared and conducted at the same time. The volume of standard HCl run down is noted.

Saponification value =

$$\frac{56.1\ (Volume\ of\ standard\ HCl\ required\ for\ the\ blank - Volume\ of\ standard\ HCl\ required\ for\ the\ sample)\ Normality\ of\ standard\ HCl}{Weight\ of\ sample}$$

5.2 CALCULATION:

Saponification value of Cold pressed groundnut oil,

$$\frac{56.1\ (30.7 - 8.5)\ x\ 0.5}{1.8056} = \mathbf{344.877}\text{mg KOH/g}$$

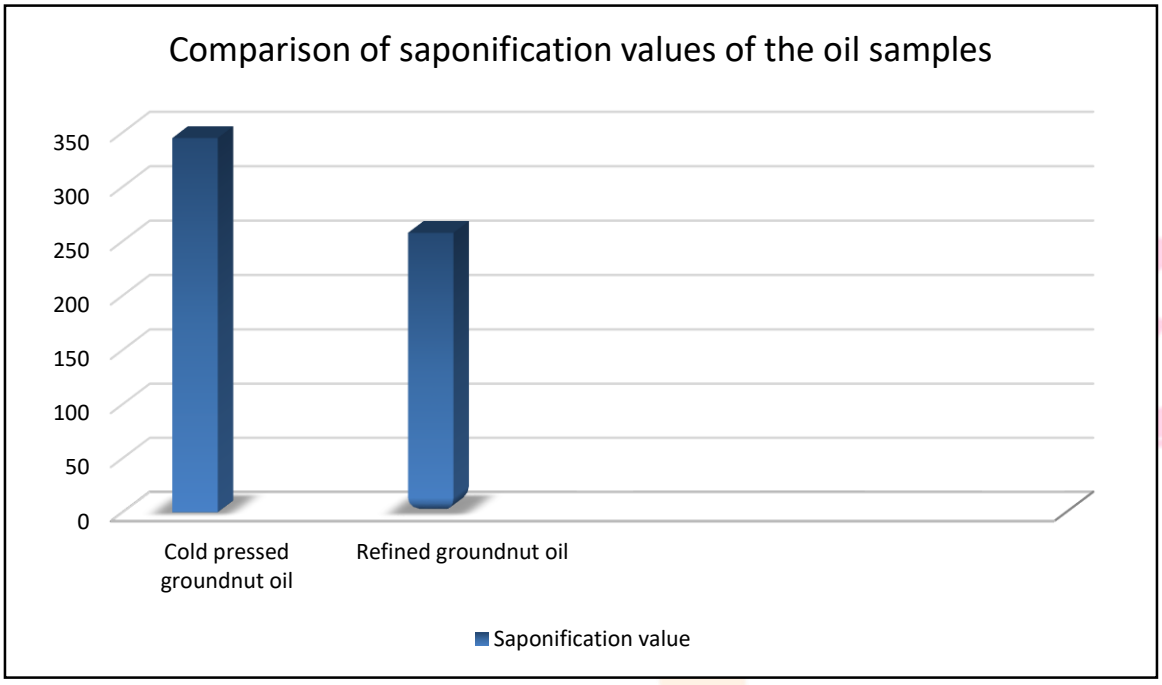
Saponification value of refined groundnut oil,

$$\frac{56.1\ (30.7 - 13.1)\ x\ 0.5}{1.9156} = \mathbf{257.715}\text{mg KOH/g}$$

5.3 OBSERVATION:

Table 6 : Saponification value of groundnut oil samples

SAMPLE	SAPONIFICATION VALUE
COLD-PRESSED GROUNDNUT OIL	344.877 (mg KOH/g)
REFINED GROUNDNUT OIL	257.715 (mg KOH/g)



Graph 5 : SAPONIFICATION VALUE OF GROUNDNUT OIL SAMPLES

5.4 DISCUSSION: The Saponification value of cold-pressed groundnut oil is greater than refined groundnut oil which indicates that Cold pressed groundnut oil has shorter fatty acid chains compared to refined groundnut oil. The saponification value of both the groundnut oils is greater than the range 187 – 196mg KOH/g oil given by FSSAI standards.

6.0 UNSAPONIFIABLE MATTER

Unsaponifiable matter (USM) consists of substances present in oils and fats which are not saponifiable by alkali hydroxides.USM fraction of vegetable oils naturally contains hydrocarbons, terpene alcohols, sterols, tocopherols, and other phenolic compounds, which may act as oxidation inhibitors. Vegetable oils typically contain 0.5-2.5 per cent USM while some others have higher amounts, 5-6 per cent.

6.1 DETERMINATION OF UNSAPONIFIABLE MATTER:

The Unsaponifiable matter for the oil samples was determined by titration method based onIS 548 (Part I) -1964.

The Unsaponifiable matter is determined by weighing the samples accurately in a conical flask. 50ml of alcoholic potassium hydroxide solution is added and boiled under a reflux condenser for one hour. The condenser is washed with about 10ml of ethyl alcohol and the mixture is transferred to a separating funnel. 50ml of water is added to the separating funnel followed by 50ml of petroleum ether. The stopper is inserted and shaken vigorously for at least a minute until both the layers are clear.

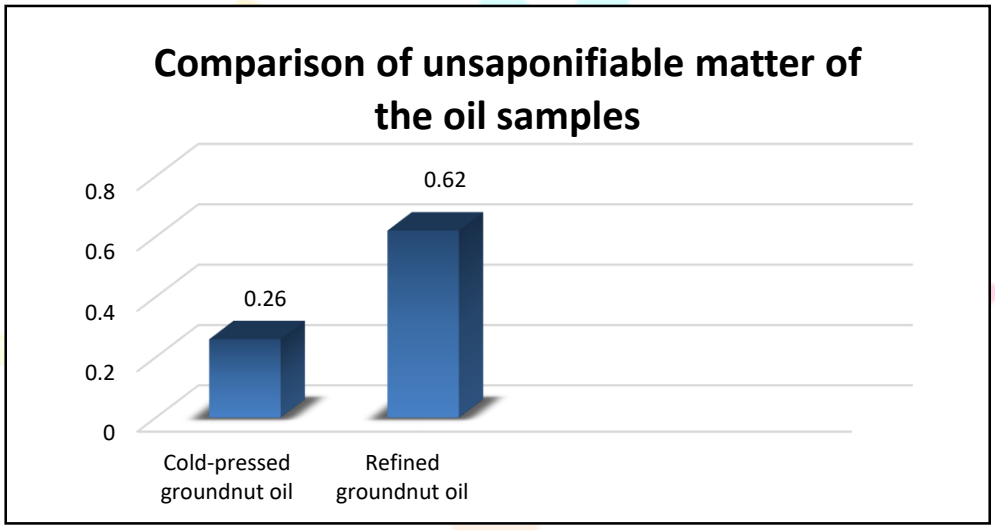
The lower layer containing soap solution was transferred to another separating funnel and the ether extraction was repeated six times using 50ml of petroleum ether for each extraction. All the ether extracts were collected and washed three times in a separating funnel with 25ml portions of aqueous alcohol by shaking vigorously and drawing off the alcohol-water layer after each washing. The ether layer is again washed successively with 20ml portions of water until the water no longer turns pink with the addition of a few drops of phenolphthalein indicator. The ether layer is transferredtared flask containing a few pieces of pumice stone, and evaporated to dryness

in a water bath under a gentle stream of clean dry air. The last traces of ether are removed by placing the flask in an air oven at 80-90 degrees Celsius for about one hour. The last traces of moisture is removed by adding a few millilitres of acetone and a gentle stream of clean dry air is passed over the surface of the material and cooled in a desiccator.The mixture is weighed and the residue is taken in 50ml of warm neutral ethyl alcohol with a few drops of phenolphthalein as an indicator and is titrated againststandard sodium hydroxide solution. The volume of NaOH run down from the burette is noted.

6.2 OBSERVATION:

Table 7 : Unsaponifiable matter value of groundnut oil samples

SAMPLE	UNSAPONIFIABLE MATTER (%)
COLD-PRESSED GROUNDNUT OIL	0.26
REFINED GROUNDNUT OIL	0.62



Graph 6 : UNSAPONIFIABLE MATTER VALUE OF GROUNDNUT OIL SAMPLES

6.3 DISCUSSION: The Unsaponifiable matter in refined groundnut oil is greater than in cold-pressed groundnut oil which indicates that phenolic compounds are high in refined oils. The standard percentage for Unsaponifiable matter should be not more than 1% according to AOCS.

7.0 TEST FOR ARGEMONE OIL

Argemone oil is non-edible oil extracted from Argemone seeds which is cheap, pale yellow and tasteless making it most suitable to be used as an adulterant. This oil contains toxic alkaloids namely, Sanguinarine and Dihydro-sanguinarine.

7.1 DETECTION OF ARGEMONE OIL: The presence of argemone oil was determined by a modified nitric acid test based on AOCS, Champaign IL, and Method Cb 3-39 (1973)

In this procedure, 5 drops of the oil sample are taken in a dry test tube and 0.5ml of 2% salicylic acid in methanol is mixed successively, to this 2 ml of concentrated nitric acid is added followed by 2 to 4 drops of concentrated sulfuric acid, and shaken well. The appearance of crimson red colour within 20-30 seconds indicates the presence of argemone oil.

7.2 OBSERVATION:

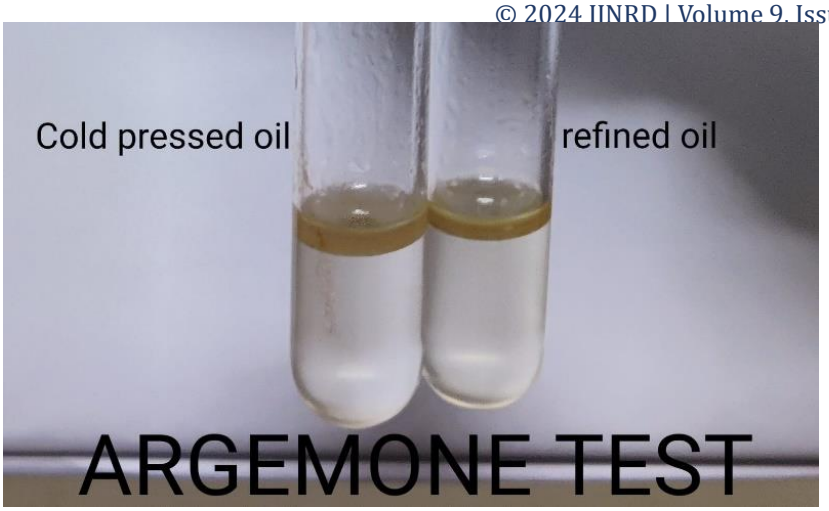


Table 8 : Test for presence of argemone oil

SAMPLE	ARGEMONE OIL
COLD-PRESSED GROUNDNUT OIL	NO CRIMSON RED COLOUR FORMATION
REFINED GROUNDNUT OIL	NO CRIMSON RED COLOUR FORMATION

7.3 RESULT: The cold-pressed and refined groundnut oil did not show any presence of argemone oil adulterant.

IV. RESULTS AND DISCUSSION

Table 9 : PHYSICAL PROPERTIES OF THE GROUNDNUT OIL SAMPLES

PARAMETERS	COLD-PRESSED GROUNDNUT OIL	REFINED GROUNDNUT OIL
COLOUR	DEEP YELLOW	LIGHT YELLOW
ODOUR	NUTTY ODOUR	ODOURLESS
STATE AT ROOM TEMPERATURE	TURBID	CLEAR LIQUID

Table 10 : ***CHEMICAL PROPERTIES OF THE GROUNDNUT OIL SAMPLES***

PARAMETERS	COLD-PRESSED GROUNDNUT OIL	REFINED GROUNDNUT OIL
ACID VALUE	3.725(mg of NaOH needed to neutralise 1g of oil)	1.576
IODINE VALUE	90.3215(g of Iodine consumed / 100g oil)	77.2210
PEROXIDE VALUE	0(meq of active oxygen/kg oil)	0.9344
IC_{50} VALUE	2084.299(µL)	581.075
SAPONIFICATION VALUE	344.877(mg KOH/g oil)	257.715
UNSAPONIFIABLE MATTER	0.26 %	0.62
PRESENCE OF ARGEMONE OIL	ABSENT	ABSENT
PROTEIN	NIL	NIL

- From the result tabulated in the table (11), it is observed that cold-pressed groundnut oil has more acid value than refined groundnut oil indicating more hydrolytic rancidity of the oil. This is because no chemicals are added to cold-pressed oil whereas chemicals are added in refined oil to increase their shelf-life.
- The Iodine value of cold-pressed groundnut oil is comparatively greater (table-11) indicating thatmore unsaturated fatty acids are present in oil. Unsaturated fatty acids are good for health and also this is one more reason why cold-pressed oils are prone to fast degradation reactions, such as oxidation.
- Peroxide value is one of the most typically used quality parameters to monitor oil oxidation and control oil quality during storage. Oils with high peroxide value have a shorter shelf life and are unsuitable for consumption as they might cause adverse health effects like stimulating cardiovascular and inflammatory diseases by increasing reactive oxygen species and secondary oxidation products.
- TheIC_{50}valueofrefinedgroundnutoilislesserthancold-pressed groundnut oil which indicates that refined groundnut oil has high antioxidant activity.
- . A low saponification value indicates that the sample has a longer fatty acid chain and a higher molecular weight and a high saponification value indicate that the sample has a shorter fatty acid chain and a lower molecular weight. Shorter and medium-chain fatty acids are absorbed directly into the bloodstream whereas long chain fatty acids are transported to the liver, increasing cholesterol levels in the blood. As per the table(11), the saponification value of cold pressed oil is greater than the refined groundnut oil, so it is indicated that cold pressed oil has more short chain fatty acids.
- Unsaponifiable matter includes tocopherols, polyphenol, sterol, hydrocarbon, and carotenoid compounds possessing food value and antioxidative properties considered as an index of edible oils quality. TheUnsaponifiable matter is a very important testing parameter for oil samples to detect the presence of adulterants such as paraffin hydrocarbons in oil. Since refined oil is supplemented with TBHQ, an Unsaponifiable matter, the USM score is more in refined groundnut oil than cold pressed groundnut oil.
- Adulteration of groundnut oil with argemone oil causes many health hazards like necrosis, glaucoma, vomiting, diarrhoea, and high tension. It also causes oxidative stress and death of red blood cells, resulting in epidemic dropsy.
  No argemone oil was detected in both cold-pressed and refined groundnut oils.

V. CONCLUSION

This study revealed

- Refined groundnut oil has better shelf life compared to cold-pressed groundnut oil, but having said that , the shelf life of cold-pressed groundnut oil is good enough though shorter than refined oil.
- The antioxidant activity of refined groundnut oil was better and could be due to the antioxidants added to the oil (as the refined groundnut oil label mentions 0.01% of TBHQ (E 319) – a synthetic permitted antioxidant is supplemented in the oil) and this antioxidant supplementation is also a factor for better shelf life of refined oil.
- Cold-pressed oil has more saponification value indicating shorter fatty acid chain and a lower molecular weight. Shorter and medium-chain fatty acids are absorbed directly into the bloodstream through portal vein, whereas long chain fatty acids enter lymphatic capillaries and then are transferred to the blood.
- Cold-pressed groundnut oil has much more unsaturated fatty acids, which are better for health, reduces the risk of atherosclerosis, increasing HDL cholesterol levels in the blood, thus improving heart health.
- Both the oils were devoid of the common oil adulterant, Argemone oil.
- There was no significant difference in other parameters.
- Although the Acid value, iodine value, peroxide value and Unsaponifiable matter values varies between the cold-pressed groundnut oil and refined groundnut oils, all the values does not exceed and are within the range of the standard values provided by food statutory bodies.

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