



Sunflower Oils

Looking for adulteration, bad fats, etc., in 12 brands

Much of the discourse around edible oils is regarding the parameters that define 'healthy' for us – these can be the smoking point (a high smoking point means the oil holds on to its nutritional content at higher temperatures), the good monounsaturated and polyunsaturated fats (as against bad saturated fats), HDL (good) cholesterol, and so on. These also have a direct correlation with our heart health and lung health, as the experts would have us believe. The more we read on the subject, the more information – and categories of cooking oil – we find ourselves having to deal with. Health claims by edible oil brands are a dime a dozen and can leave the consumer confused about the best/better buy. As it is, one may be sceptical about some of the hyperbolic claims made about health benefits. With so many varieties and brands vying for their share, the market is a highly competitive one too. Since each holds a different set of pros and cons, it really is hard to pick one. So, are all sunflower oils suitable for your consumption? Are all brands made equal – in other words, are they all as good as another and do they meet the basic requirements? Do we know that the iodine value in your sunflower oil is a measure of the unsaturated fats therein? How many of us know that the oil must not have any traces of argemone oil or castor oil? Or that the lower the acid value, the better the quality? This report is a first-hand study of 12 brands available with various retailers in India and the good news is that in the overall evaluation most of the brands fall within the 'very good' category.

We purchased 12 popular brands of refined sunflower oil and subjected these to testing on parameters important to judge the quality of the product. The key parameters included presence of heavy metals, antioxidants, aflatoxins and pesticide residues, adulteration with non-edible oils and colouring matter, rancidity, moisture, insoluble impurities, saponification value, iodine value, acid value and flash point. The products were in polypacks of one-litre capacity. Brands Dalda and Sunpure claim to be imported oils on their packing.

The tests were conducted at an NABL-accredited laboratory and as per requirements specified in Indian Standard IS: 4277-2014 and Food Safety and Standards (FSS) Regulations, 2011, as well as nutritional declarations.

Based on the results, we have concluded that most of the tested brands fulfil the minimum requirements and can be considered to be safe for human consumption. While there were some variations, these were well within the specified limits. Use of re-heated oils should be avoided.

The oil extracted from the seeds of sunflowers is known as sunflower oil. It has a high quantity of vitamin E, in the form of alpha-tocopherol, which makes it excellent for being used in cooking. It has a high smoking point, which means that sunflower oil holds on to its nutritional content at higher temperatures.

As a form of cooking and frying oil, the high linoleic acid content in sunflower oil is considered to be a desirable constituent. Of course, the linoleic acid also leads to storage problems due to oxidation resulting in off-flavours and rancidity. It is, therefore, highly desirable to use appropriate antioxidant(s) in prescribed quantities to improve its shelf life during storage.

Look for the high oleic variety of sunflower oil for deep-frying. High oleic oil is high in monounsaturated fats (MUFA) and has no harmful trans-fat.



CV RECOMMENDATION | TOP PERFORMER

Gemini

VALUE FOR MONEY

Freedom | Healthy Heart

BRANDS TESTED

Rank	Total Score out of 100 (rounded off)	Brand	Type	MRP/Retail Price (in Rs, per litre)	Best before	Manufactured/Marketed by
1	94	Gemini	Refined	93/87	9 months	Cargill India Pvt. Ltd
2	93	Sundrop	Refined	195/195 (20% free in this pack)	6 months	Agro Tech Foods Ltd
3	92	Freedom	Refined	109/81	6 months	Gemini Edible & Fats India Pvt. Ltd
3	92	Healthy Heart	Refined	115/81	9 months	Healthy Heart Foods
4	91	Sunrich	Refined	98/79	9 months	Ruchi Soya Industries Ltd
4	91	Gold Drop	Refined	108/95	9 months	Lohiya Edible Oils Pvt. Ltd
4	91	Nature Fresh Acti-lite	Refined	105/110	9 months	Cargill India Pvt. Ltd
4	91	Fortune Sunlite	Refined	95 (South) (115 rest of India)/110	9 months	Adani Wilmar Ltd
5	90	Gold Winner	Refined	95 (TN), 107/83 (rest of India)	6 months	Kaleesuwari Refinery Pvt. Ltd
6	89	Dhara	Refined	129 (offer price 90)	9 months	Mother Dairy Fruits & Vegetable Pvt. Ltd
7	88	Dalda	Refined (imported)	119/109	6 months	Bunge India Pvt. Ltd
8	87	Sunpure	Physically refined (imported)	105/81	6 months	MK Agrotech Pvt. Ltd

Score Rating: >90: very good*****, 71-90: good*****, 51-70: average***, 31-50: poor**, up to 30: very poor*

Key Findings

- Based on the overall test findings, Gemini is the top performer and is followed by Sundrop.
- The value-for-money brands are Freedom and Healthy Heart.
- All the brands met the standard requirements and can be considered safe for consumption.
- Harmful substances – that is, pesticides, aflatoxins and trans fat – were not found in any brand. Heavy metals were found in two brands but these were well below the specified limits.
- Iodine value of Dalda and Sunpure (imported oils) was found to be lower than the requirement of the standards.

Shelf Life

The declared shelf life of all tested brands is six to nine months. Where the shelf life is six months, there is all the more need for consumers to be aware, particularly if they are buying the large pack of five litres or higher capacity. They must ensure that the oil remains stable within the consumption period.

TEST RESULTS FOR PHYSICOCHEMICAL PARAMETERS

Heavy Metals | Non-Edible Oils | Antioxidants |
Saponification Value | Iodine Value | Unsaponifiable
Matter | Refractive Index | Rancidity | PUFA | MUFA |
Moisture and Insoluble Impurities | Acid Value | Flash
Point | Hexane | Aflatoxins | Pesticides | Saturated Fat
| Trans Fat | Colouring Matter

◆ Heavy Metals

We tested the brands for any trace of lead, arsenic, mercury and cadmium. Any traces must be within the permissible limit for these toxic metals.

a) Lead: Lead, a cumulative poison, enters oil either through the soil or during production. It accumulates in the body and causes irreversible damage to the brain, nerve cells, red blood cells and the kidneys. The permissible limit for lead in sunflower oil is a maximum 0.5 parts per million (ppm).

- All brands cleared the test.

b) Arsenic: Ingestion of arsenic can lead to gastrointestinal symptoms such as severe vomiting, high blood pressure, heart attack, etc. As per FSS

Regulations, the maximum permissible limit is 0.1 ppm; as per Indian Standard it is 0.05 ppm.

- All brands fell within the limits specified by the national standards. Arsenic in Gold Drop was found to be 0.06 mg/kg.

c) Mercury: The maximum permissible limit is 0.25 ppm as per Indian Standard and 1 ppm as per FSS Regulations.

- Mercury was not detected in any of the brands.

d) Cadmium: The maximum permissible limit is 1 ppm as per Indian Standard and 1.5 ppm as per FSS Regulations.

- Cadmium was not detected in any of the brands.

◆ Antioxidants

Antioxidants are the permitted food additives which when added to food products prevent their oxidative deterioration for better nutritional stability and quality. We tested the 12 sunflower oil brands for two types of antioxidants: TBHQ and butylated hydroxyanisole (BHA). FSS Regulations recommend that antioxidants should not exceed 0.02 per cent, or 200 ppm, in concentration.

- While BHA was not detected at all (up to the detection limit of 2 ppm), TBHQ was either not detected (Gemini, Sundrop, Nature Fresh,



Comparative Test

Sunpure) or found to be within the maximum recommended limit.

◆ Saponification Value

The saponification value helps to detect the presence of other oils/fats. Saponification value of sunflower oil should be between 188 and 194.

- *All brands were within the specified limit.*
- *Gemini scored highest on this parameter.*

◆ Iodine Value

The iodine value is a measure of the unsaturated fats. It is expressed in terms of the number of centigrams of iodine absorbed per gram of sample (% iodine absorbed). Iodine value of sunflower oil shall be in the range of 100–145. For imported oil it shall be 118–141.

- *Iodine value of Sunpure and Dalda (imported oils) was found to be less than 118–141, which means these brands did not meet the requirement set by the national standard for imported oils.*
- *Other brands were within the specified limit.*

◆ Unsaponifiable Matter

Unsaponifiable matter must not be more than 1.5 per cent by weight of sunflower oil.

- *All brands were within the specified limit.*
- *Healthy Heart, Gemini and Freedom had lower unsaponifiable matter.*

◆ Refractive Index (at 40 degrees Celsius)

Refractive index of oil can be used to detect rancidity. It shall be 1.4640–1.4691 for sunflower oil; for imported category it shall be 1.461–1.468.

- *All brands were within the specified limit. They were clear and without any haziness.*

Oils and Their Fats

All edible oils have virtually the same fat content but the proportion of different types of fatty acids varies from one type of oil to another. To begin with, there are unsaturated and saturated fats. Eating a lot of saturated fat increases the level of bad cholesterol (low-density lipoproteins, or LDL) in the blood. And it is generally acknowledged that high levels of

LDL place you at greater risk of heart disease.

Unsaturated fats are of two kinds: monounsaturated fats (MUFA) and polyunsaturated fats (PUFA). MUFAs lower the level of bad cholesterol (LDL) in the blood and raise the good cholesterol (HDL). PUFAs, on the other hand, reduce both the good and the bad cholesterol.

Then there are the trans fatty acids. These are unsaturated fatty acids produced when unsaturated oils are converted into semi solids by a process called hydrogenation. These are unsaturated fats but resemble saturated fats in many ways. Just like saturated fats, they also raise the level of 'bad' cholesterol in the blood.

- *In the tested sunflower oil brands, saturated fatty acids ranged from 10.31 gm/100 gm (in Sundrop) to 12.71 gm/100 gm (Dalda).*
- *For MUFAs, the results ranged from 27.40 gm/100 gm (Sundrop) to 23.29 gm/100 gm (Dalda).*
- *PUFAs ranged from 65.68 gm/ 100 gm (Sunrich) to 62.57 gm/ 100 gm (Fortune).*
- *Trans fat was not found in any of the 12 brands.*

◆ Acid Value

The acid value is the number of milligrams of potassium hydroxide necessary to neutralise the free acids in one gram of sample. The maximum acid value of sunflower oil shall be 0.5.

- *All brands were within the specified limit.*
- *Freedom, Sunrich and Fortune had lower acid values.*

◆ Flash Point

The flash point of a volatile material is the lowest temperature at which it can vaporise to form an ignitable mixture in air. At the flash point, the vapour may cease to burn when the source of ignition is removed. It should not be less than 250 degrees C as per Indian standard.

- *Flash point of all brands was found to be well above the specified limit.*

◆ Hexane

Hexane is used to extract cooking oils from seeds.

- *Hexane was not detected in any of the brands, up to a detection limit of 0.5 ppm.*

These Must Be Absent in Your Sunflower Oil

Non-Edible Oils (argemone oil, castor oil, mineral oil) | Rancidity (off-flavour/taste) | Insoluble Impurities | Colouring Matter

- *All brands were found to be free of these elements.*

◆ Aflatoxins

Aflatoxins are poisonous and cancer-causing chemicals that are produced by certain moulds (*Aspergillus flavus* and *Aspergillus parasiticus*) that grow in soil, decaying vegetation, hay and grains. In edible oils, aflatoxins generally develop due to poor oil seed storage conditions; the presence of undesirable moisture in the oil seed enables aflatoxins to develop in the stored oil seeds.

Aflatoxins are highly toxic compounds and can cause both acute and chronic toxicity in humans and many other animals. Four types of aflatoxins are naturally found in foods. These are aflatoxins B1, B2, G1 and G2. Aflatoxin B1 is the most commonly found in food and also the most toxic.

The FSS Regulations have set the limit for aflatoxins in sunflower oil at 30 parts per billion (ppb). Agmark requires aflatoxins to be entirely absent in sunflower oil.

- *All brands were within the limit set by FSS Regulations.*

◆ Pesticides

Pesticide is a chemical or biological agent (such as a virus, bacterium, antimicrobial, or disinfectant) that deters, incapacitates, kills, or otherwise discourages pests. Pesticides can be added during farming but must be absent in the final product.



These may cause acute and delayed health effects in people who are exposed. Such adverse health effects range from simple irritation of the skin and eyes to more severe effects like affecting the nervous system, mimicking hormones causing reproductive problems, and causing cancer.

We conducted tests for following pesticides residues as per requirements of FSS Regulations.

a) **Phenthoate:** Maximum permissible limit is 0.01 ppm.

- *It was not detected in any of the samples.*

b) **Phorate:** Maximum permissible limit is 0.05 ppm.

- *It was not detected.*

c) **Trichlorfon:** The maximum residue limit (MRL) has not been specified.

- *It was not detected.*

Specific Gravity at 30 degrees C

Specific gravity is the ratio of the density of a material to the density of water. Specific gravity of edible oils should be less than 1.00 as they are immiscible liquids, which means they are insoluble in water. There is no specific requirement specified in the standards.

As per our tests, the specific gravity of the brands ranged from 0.9005 to 0.9185.

PHYSICOCHEMICAL

Parameter	Weightage (%)	Gemini	Sundrop	Freedom	Healthy Heart
Heavy metal	8	7.8	8	8	8
Non-edible oils	6	6	6	6	6
Antioxidant	6	6.0	6.0	4.88	5.85
Saponification value	5	4.5	4.18	4.17	3.87
Iodine value	5	3.78	3.71	3.93	3.29
Unsaponifiable matter	5	4.95	4.85	4.95	5.0
Refractive index	5	4.7	4.4	4.85	4.4
Rancidity	5	5	5	5	5
PUFA	5	4.53	4.20	4.5	4.59
MUFA	5	4.07	4.61	4.07	4.07
Moisture and insoluble impurities	4	4	3.84	3.36	3.52
Acid value	4	3.8	3.84	4	3.56
Flash point	4	3.68	3.84	3.6	3.44
Hexane	4	4	4	4	4
Aflatoxins	3	3	3	3	3
Pesticides	3	3	3	3	3
Saturated fat	3	2.43	2.52	2.41	2.47
Trans fat	3	3	3	3	3
Colouring matter	3	3	3	3	3



Manufacturers' Comments

As a matter of policy, before publication, the test results of the brands are shared with their respective manufacturers/marketers inviting their views/comments.

Many of the tested brands – Dalda, Healthy Heart, Gold Drop, Freedom, Gemini, Nature Fresh, Dhara, Sunpure – responded with comments on certain parameters. We provided the necessary clarification on those points, where required after retesting.

Dalda sent their factory test result and other lab test results, which were different from our lab results, and requested for once again reviewing the results for iodine value, acid value and saponification value. Since retesting was already carried out, we declined to do further testing at that stage.

SCORES

	Sunrich	Gold Drop	Nature Fresh	Fortune	Gold Winner	Dhara	Dalda	Sunpure
	8	7.88	8	8	8	8	8	8
	6	6	6	6	6	6	6	6
	5.77	4.30	6.0	5.34	5.67	3.38	5.31	6.0
	3.58	4.0	4.02	3.97	3.61	3.75	3.86	3.63
	3.64	3.65	3.12	2.99	3.47	3.03	1.50	1.25
	4.7	4.8	4.8	4.75	4.8	4.75	4.7	4.75
	4.7	5	4.4	4.85	4.85	4.4	3.40	3.25
	5	5	5	5	5	5	5	5
	4.65	4.59	4.39	4.19	4.31	4.61	4.40	4.52
	4.10	4.15	4.19	4.05	4.15	4.11	3.99	4.11
	2.72	3.84	3.68	3.68	3.2	3.84	3.84	2.72
	3.96	3.44	2.88	3.96	2.52	3.56	3.76	3.76
	3.36	3.52	3.76	3.36	3.52	3.6	3.6	3.76
	4	4	4	4	4	4	4	4
	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3
	2.52	2.51	2.42	2.48	2.35	2.5	2.31	2.46
	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3



Comparative Test

FOR GENERAL QUALITIES

◆ Marking/Labelling

The following details shall be marked on each pack:

- Name and trade name
- Type and grade of oil
- Name and address of manufacturer/marketer
- Batch number, month and year of manufacture
- The product is 'free from argemone oil'
- Nutritional information
- The words 'best before' (month and year)
- Net volume/weight
- Standard mark, if any (Agmark)

j) Green dot denoting vegetarian status

k) Customer care details

l) FSSAI license number

- All brands have given the necessary information on their packs.

◆ Packing

The sunflower oil should be packed in food-grade material that does not affect the properties of the oil and at the same time maintains the shelf life of the product. As far as possible, the product shall be either in such packages that can be recycled or packed in reusable and/or biodegradable materials.

- All brands were in polypack of one-litre capacity.

Net Weight

According to Legal Metrology (Packaged Commodities) Rules, for 1,000 ml–10,000 ml the tolerance limit is 1.5 per cent.

In our tests, all brands were found within the tolerance range ± 1.5 per cent. Except for Sundrop, all brands were found to exceed the claimed quantity.

Physical Observations/Tests

Physical observations on the 12 samples were made by laboratory scientists. The oil has to be a) clear, b) free of off-odour, and c) free of rancidity, adulterants, non-edible oils, sediments, suspended and other foreign matter, separated water and added colouring and flavouring substances.

Gemini, Healthy Heart and Dalda were given the highest score. The other brands followed close behind and were given equal scores.





How To Best Match Your Oils To Foods

One of the most important things to keep in mind is that oil behaves differently when heated – it changes texture, colour, taste and nutritional properties. When the oil reaches its smoking point, a lot of the nutrients are destroyed and it can sometimes form harmful compounds.

The only way to ensure that you consume healthy oil is by switching between two-three of them – for instance, by using groundnut oil one month and then using sunflower oil/mustard oil in another. Any single oil alone is not preferred.

Blending oils is another option, whereby you take equal proportions of different oils in one container and then use it. This way you do not get prolonged exposure to the side effects of one type of oil and also get the benefits of different oils.

You could also have two or more different kinds of oils in your kitchen which you could use for different purposes. For example, you could use olive oil for salads, groundnut/rice bran oil for frying, and mustard/soybean/sunflower oil for other cooking purposes. This will let you avail of the health benefits offered by each oil brand.

Monounsaturated	Polyunsaturated	Saturated	Trans
Good Fat	Good Fat	Bad Fat	Bad Fat
Reduces bad cholesterol (LDL) levels and increases good cholesterol (HDL) levels	Reduces bad cholesterol (LDL) levels	Increases overall cholesterol levels, especially bad cholesterol	Increases the bad cholesterol (LDL) level and decreases good cholesterol (HDL) levels
Found in nuts and seeds, avocados, olive oil and canola oil	Found in fatty fish such as salmon, mackerel, trout and sardines, and also in corn, safflower, sunflower and soybean oils	Found in animal-based foods such as meat, poultry and eggs, and also in butter, cream and other dairy products Also found in plant-based products such as coconut, coconut oil, palm oil and palm kernel oil, and cocoa butter	Found in hydrogenated fat products such as margarines and vegetable shortenings Used in packaged snack foods such as cookies, crackers and chips, and in fried foods