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REVIEW ON TRADITIONAL EXTRACTION OF GROUND-NUT OIL

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ABSTRACT

“Cold pressed Ground-nut oil” is used as a cooking oil, especially used for sautéing and deep frying. It has a high smoke point which is suitable for Indian cooking. Cold pressing technique retains all its natural flavor, aroma, nutritive value making this oil excellent for cooking and adds more taste to food dishes. Several studies have revealed that groundnuts contain a good source of compounds like resveratrol, phenolic acids, flavonoids, and phytosterols that block the absorption of cholesterol from the diet. It also contains Co-enzyme Q10 and arginine that is recognized for having disease preventive properties and are thinking to promote longevity. Groundnut Oil was probed in the laboratory and results showed that it contains Total Fat (99.86g/ 100g), of which MUFA (61.74g), PUFA (19.27g), SAFA (18.83g) and cholesterol (0g).

KEYWORDS

Cold pressed oil, Groundnut, MUFA, PUFA, Omega 3 fatty acids and Omega 6 fatty acids.

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INTRODUCTION

Cold press grinding is one of the earliest known methods of processing oil. Extracting oil from seeds using a low heat method is known as “Cold-Pressed Oil”. This method helps in retaining all its flavor, aroma, nutritive value making this oil great for cooking and adds more taste to food dishes. Groundnut oil, sesame (til) oil, coconut oil, mustard oil are some of the varieties of cold-pressed oils currently used for cooking, salad dressings, and

baking. In addition to cooking, they are also used for skincare either directly or indirectly in cosmetics. Some varieties of cold-pressed oils used in cosmetics are almond oil, walnut oil, and castor oil.

In this method, a strong circular wooden mortar is used to grind and crush peanuts. No external heat is required to carry out the process. Meanwhile, the high temperature is procured internally to carry out the method. The cold-pressed oil is stored in a scooped circular pit and it is not refined, bleached, or deodorized. This technique of oil extraction does not require heat and thus ensures that the nutrients in the oil remain intact and preserves flavor which is otherwise lost by heat in the extraction of refined oil¹. Oxidative stability is a standard marker for the cold-pressed oils which contain natural antioxidants such as carotenoids, tocopherols, sterols, phospholipids, phenol compounds, etc. and undesirable oxidizing substances (e.g. chlorophylls, metals) in the refining process².

The peanut, also named as the "groundnut," "monkey nut" or "goober pea". Taxonomically it is titled as "*Arachis hypogaea*," which is a legume crop merely cultivated for its edible seeds. It is widely grown in tropics and subtropics and is beneficial to small and large commercial producers. Because of its high oil content, it is listed as both a grain legume and an oil crop. Every year groundnuts total production is about 7,131 million metric tons in India (USDA, PS and D database 1996-2000). Groundnut is India's largest oilseed crop and plays a major role in the country's vegetable oil deficit. Groundnuts are available in India year-round, due to a two-crop cycle harvested in March and October³.

Peanuts are rich in beneficial nutrients that provide healthy energy. They are full of healthy fats, protein, and contain the healthiest form of carbohydrates, fibre. At least half of the fat in peanuts is heart-healthy monounsaturated fat and over 30% are polyunsaturated fat, making them very low in saturated fat, and they contain a significant amount of protein and fibre even in small doses. They contain extra protein than any other nut. Peanut proteins and other legume proteins, such as soy proteins, are nutritionally equitable to meat and eggs for human growth and health, as per the Protein

Digestibility Corrected Amino Acid Score (PDCAAS)^{3,4}. Super-protein which is present in peanuts at very high levels known as "Arginine". It helps with the production of nitric oxide in the body which inhibits blood clotting, may help to decrease blood pressure, maintain muscle mass, aids in liver detoxification, reduce alcohol toxicity levels, and improve wound healing.

Peanuts are also an excellent source of nine vitamins and minerals which make them the most nutrient-dense nut. Research has found that people who eat peanuts regularly have diets with higher nutrient quality. In a study of over 15,000 people who consumed peanuts and peanut products, it was found that levels of vitamin A, vitamin E, magnesium, folate, iron, zinc, calcium, and dietary fibre were higher than those who did not consume peanuts⁵. During some research, the researcher observed that when peanuts are consumed along with their skins, their antioxidant capacity doubled and they have also shown to have greater antioxidant capacity than green tea and red wine⁶. Roasting peanuts can further increase their antioxidant capacity, and roasted peanuts have a significantly higher antioxidant capacity with their skins than blueberries.

Phytochemical mainly "Resveratrol" found in peanuts, red wine, and grapes. Nearly a decade of research provides clear evidence that resveratrol plays a vital role in reducing body weight, decreasing cancer and diabetes risk, and extending life. It has also shown to have possible protective effects against hearing loss and Alzheimer's. Most of the resveratrol is found in the peanuts skin and Southern-style boiled peanuts. Peanut and its products like peanut oil, peanut butter all contain phytosterols that block the absorption of cholesterol from your diet and may decrease inflammation and reduce the growth of various cancers. It has also shown that phytosterols can reduce tumor growth. Peanut skins are rich in phenolic acids and are shown to be antioxidant in nature and protect against oxidative damage, such as seen in coronary heart disease. They may also play a role in blood circulation post meals. Peanuts have a low glycaemic index (GI) and glycaemic load (GL), and hence are good for diabetics⁷.

Use of peanut is worldwide which varies widely, and commercial goods are often variant and usually regional. Peanuts has been introduced into several items such as roasted peanuts, peanut oil, peanut butter, peanut paste, peanut flour, peanut beverage, peanut milk, peanut snacks, and peanut cheese etc. Peanut oil is obtained using different extraction methods and is mainly consumed in the Asian subcontinent, mainly in India. The largest quantity of the world's peanut production is used for oil production. World oil production increased from 4.53 million tons in 2000 to 4.91 tons in 2010. Production across the world, where China (44%), India (20%) and Nigeria (11%) are the largest producers, i.e., total of 75 percent of peanuts production is used as a complete dietary source for people on expeditions to various areas such as Antarctica, space, and trekking.

REVIEW OF LITERATURE

The consumption of either peanuts or processed peanuts is beneficial to health, because of their desirable fatty acid composition profile that is higher in unsaturated fatty acids and lower in saturated fatty acids. Vegetable oil is trans-fat free, cholesterol-free, and low in saturated fats. It shows several positive biological effects, which are mostly connected with its high oleic acid content. Several studies have disclosed that consumption of peanuts or peanut oil is related to reduced incidence of cardiovascular disorder, improvement of lipid profiles, decrease in LDL oxidization, and provision of a cardio-protective effect. Frequent intake of peanut and its products may reduce the risk of colorectal cancer⁸.

Peanuts contain healthy monounsaturated fatty acids, plant proteins, magnesium, potassium, fibre, arginine, and plenty of bioactive elements, that can be beneficial to lowering blood pressure level⁹. Arginine is an amino acid that is a precursor to nitric oxide that help to relax the arteries, increase blood flow, and healing time in tissues throughout the body¹⁰. However, research has shown that this amino acid can enhance circulation and cure impotence and heart disease. Peanuts contain a strong source of magnesium. In one test, individuals fed peanuts for three weeks daily not only had a higher magnesium

intake but also increased blood magnesium to above normal levels⁵.

The study reported reduction in diabetes risks by a quarter in 2002, when peanuts were incorporated daily into the diet. Some studies examined the effect of groundnut oil in streptozotocin-diabetic rats and compared them with diabetic and drug-treated rats on various parameters such as blood glucose, lipid profile, lipid peroxidation, and antioxidant status. After 42-day consumption of groundnut oil, it showed slight but significant decreases in the blood glucose, HbA1c, lipid peroxidation, and lipid profile and increases antioxidant levels in diabetic rats¹¹.

The Harvard School of Public Health has shown that the risk of type 2 diabetes decreases with the more regular intake of peanuts and peanut butter. Participants who ate 1-ounce of peanuts or peanut butter 1 to 4 times a week observe a 10% reduction in risk, while participants who ate 1-ounce 5 or more times a week decreased their risk¹² by 25%.

In particulars, the phytosterols in peanuts that has been studied in regards to cancer¹³, they have reported to reduce prostate tumor growth by over 40% and cut the occurrences of cancer spreading to other parts of the body by almost 50%. Like phytosterols, resveratrol has also shown to cut off the blood supply to growing cancers and to inhibit cancer cell growth^{14,15}. Peanuts, peanut butter, peanut flour, and peanut oil are all packed with phytosterols (beta-sitosterol, campesterol, and stigmasterol) that block the absorption of cholesterol from the diet¹⁶. Emerging findings show that they also significantly reduce inflammation and decrease the growth of various cancers such as lung, stomach, ovarian, prostate, colon, and breast cancer¹³.

It is observed that Peanuts are an excellent source of vitamin E and they also have a high amount of niacin, both are known to protect against age-related cognitive decline diseases such as Alzheimer's. The study also showed that in nearly 4000 people, niacin from food slowed the rate of cognitive decline for 65 years or older population¹⁷. Resveratrol is also been recognized as beneficial in Alzheimer's disease and other nerve degeneration disease¹⁸. It is also been found that those who eat peanuts five times a week

or more have a reduced risk of gallbladder disease¹⁹ by as much as 25%.

Mattes *et al.* in his studies showed that incorporating peanut into the diet does not lead to weight gain or higher body weight. In weight loss study, diets supplemented with peanuts, peanut butter, and peanut oil are more acceptable among subjects of all age groups and have shown long-term weight maintenance²⁰. In another research exclusively on school children, it was found that there was a weight loss in the peanut fed group whereas the control group gained weight in 2 years²¹.

Emerging evidence is also showing that the type of healthy monounsaturated fat in peanuts may stimulate a hormone that helps satiety after meals²². Peanut eaters tend to have a lower body mass index²³ (BMI), showed that despite being energy-dense, peanuts have a high satiety value and chronic ingestion evokes strong dietary compensation and little changes in energy balance. The mechanism behind this conversation could be enhanced satiety. The hunger and energy compensation, inefficient absorption of whole peanuts, or increased resting energy expenditure^{24,25}.

Peanuts are an excellent source of resveratrol, a polyphenol antioxidant²⁶ which has found to have a protective function against cancers²⁷, heart disease²⁸, tumor²⁹, and inflammation³⁰. This bioflavonoid is believed to improve blood flow in the brain as much as 30 %, thus reducing the risk of strokes³¹. Besides the antioxidant properties that protect against cardiovascular diseases such as arteriosclerosis, it has been demonstrated that resveratrol acts as a chemo-preventive agent against several types of cancer by modulating tumor initiation, promotion and progression phases³².

METHODOLOGY

Figure No.1 The mortar is fixed to the ground and is usually made up of wood. The pestle is made from "Vagai Wood". Firstly, the freshly formed high quality oil seeds are cleaned and weighed. A pack of oilseed is loaded into the mortar. As the churner moves around the mortar, the pestle grinds the oilseed inside. Some amount of water is used after the seed has grounded. The pestle's kneading motion

expels oil through a small hole at the bottom of the mortar when the water combines with the oilseeds under the ground. This releases oil, which is then filtered and collected in a container and then stored in stainless tanks.

RESULTS AND DISCUSSION

The shelf life of a food is the time period within which the food is safe to consume and /or has an acceptable quality to consumers. By performing shelf life analysis; one can define accurate dates for products, ensuring that the quality remains acceptable and safe for consumers.

Shelf life depends on physical, microbiological, and chemical processes taking place in the product when stored under the recommended condition. Chemical changes include oxidation of food, change and loss in colour, change in pH, enzymatic deterioration. Physical tests assessed are moisture content, textural changes, breakage or clumping of food. Microbial assessment for the absence of pathogenic microorganism as per regulatory standards is carried out. Apart from microbial and chemical shelf life of food products, sensory aspects of the food products like its flavour, texture and appearance for example play a vital role in consumer acceptability.

The product, Groundnut Oil, was kept in a plastic container. It was stored in room conditions for 1.2 month and then accelerated for 7.8 weeks in conditions equivalent to 7.8 months in room conditions. It was tested for microbial, chemical and organoleptic parameters. In terms of organoleptic parameters, black deposition was observed at the bottom of the container in the C and D phase. However, since the sample is cold-pressed, sensory observations in C and D phase were considered acceptable in the product. The results of analysis of the food sample conform to the recommended limits for the tested parameters only and the sample has shelf life of 9 months from date of manufacturing.

Table No.1: Nutrition Facts of Groundnut Oil

S.No	Parameters	Units	Method	Result of Analysis
1	Energy	Kcal/100g	SOP-CHM-29-00	898.74
2	Total Carbohydrates	g/100g	SOP-CHM-28-00	0.00
3	Protein	g/100g	By FSSAI manual 5 (14.9): 2016	0.00
4	Total Fat	g/100g	By FSSAI Manual 4 (A8): 2016	99.86
5	Sugar	g/100g	By FSSAI manual 5 (10.1): 2016	0.00
6	Saturated Fat	g/100g	AOAC 996.06 20 TH Ed.	18.838
7	Trans Fat	g/100g	AOAC 996.06 20 th Ed.	0.00
8	MUFA	g/100g	AOAC 996.06 20 th Ed.	61.745
9	PUFA	g/100g	AOAC 996.06 20 th Ed.	19.275
10	Cholesterol	mg/100g	AOAC 994.10 20 th Ed.	<1.0 N.D.
11	Sodium	mg/100g	SOP -CHM-27-00	0.99
12	Dietary Fibre	g/100g	AOAC 985.29 20 th Ed.	0.00

Groundnut Oil was analyzed in laboratory and result showed that it contains Total Fat (99.86g/ 100g), of which MUFA (61.74g), PUFA (19.27g), SAFA (18.83g) and cholesterol (0g). 50-55% oil extracted.

Table No.2: Shelf Life analysis Groundnut Oil

Tests	Date of Analysis		11 July 19	24 July 19	14 Aug 19	4 Sep 19	Specified limits
	Phase	Units	A immediately after receiving zero time	B after 1.5 week	C after 4.8 weeks	D after 7.8 weeks	
MICROBIOLOGICAL	Total viable count	cfu/g	4.0 x 10 ¹	1.1 x 10 ²	1.1 x 10 ²	1.1 x 10 ²	<10 ⁴
	Coliforms	cfu/g	<10	<10	<10	<10	<10
	E coli	org/g	Absent	Absent	Absent	Absent	Absent
	Salmonella	org/25g	Absent	Absent	Absent	Absent	Absent
	Staphylococcus aureus	org/g	Absent	Absent	Absent	Absent	Absent
	Yeast	cfu/g	<10	<10	<10	<10	<10 ³
	Mold	cfu/g	<10	4.0 x 10 ¹	4.5 x 10 ¹	4.5 x 10 ¹	<10 ³
CHEMICAL	pH		5.38	5.31	5.29	5.28	Not Specified
	Acid Value		0.90	0.93	1.01	1.11	Max 6
	Iodine Value		95.54	95.75	95.63	96.09	85 - 99
	Peroxide Value	meq/kg	0.86	0.99	1.02	1.43	Not Specified
	Moisture	g/100g	0.15	0.13	0.15	0.18	Not Specified
ORGANO LEPTIC	Appearance in terms of colour		5	5	3	3	3 to 5
	Odour		5	5	5	5	3 to 5
	Taste		NA	NA	NA	NA	3 to 5
	Texture/ Consistency		5	5	5	4	3 to 5
Result	-	Pass	Pass	Pass	Pass	Pass/Fail	
Shelf Life Obtained	Months	-	3	6	9	-	



Figure No.1: The primary stages of cold-pressing oil

CONCLUSION

We found that the fatty acid composition analysis showed that groundnut oil is a rich source of monounsaturated fatty acids followed by polyunsaturated fatty acids and saturated fatty acids. The total extraction of oil is 40-44% per batch. Cold-pressed oil is a good source of anti-oxidants, Omega-3 and Omega-6 fatty acids. Since cold-pressed is naturally extracted it doesn't lose vitamin E. It is trans-fat free and contains zero cholesterol. There is no heat processing or chemical flushing so the oil is devoid of trans-fat and harmful chemicals and it contains a natural source of nutrients. Dietary MUFA consumption promotes a healthy profile of lipids within the blood, maintain blood pressure, increases insulin sensitivity, and controls glucose levels. Evidence from laboratory studies that provide compelling evidence that replacing carbohydrates with MUFA raises concentrations of HDL cholesterol, and that replacing SFA with MUFA decreases concentrations of LDL cholesterol and total / HDL cholesterol. Polyunsaturated fatty acids (PUFAs) are necessary for overall fitness. Both omega 3 and omega 6 PUFA are processed at the stage of cyclooxygenase and lipoxygenase to active promoters of eicosanoid synthesis. Omega 3 polyunsaturated fatty acids are cardio-protective, perhaps through their anti-inflammatory, anti-

arrhythmic, lipid-lowering, and antihypertensive effects. Key elements of cell membranes known as omega-3 and omega-6 fatty acids are also precursors to many other substances in the body, such as those involved in blood pressure control and inflammatory responses. Omega-3 fatty acids are increasingly being assisted in protecting against fatal heart disease and it is understood that they have anti-inflammatory effects which may be significant in this and other diseases. The role of omega-3 fatty acids in the prevention of diabetes and other forms of cancer is also enormously of concern.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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