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Evaluation of nutritional quality of cake supplemented with peanut butter

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Abstract
In this study Hydrogenated fat was reduced using peanut butter to decrease the level of saturated fatty acids in cakes. Cakes were prepared using different ratio of hydrogenated fat and peanut butter (1:1, 0.8:0.2, 0.6:0.4, 0.4:0.6, 0.2:0.8, 0:1) were further analyzed to determine fatty acid composition and biochemical properties. Saturated fatty acids (Palmitic acid, Stearic acid and Myristic acid) were comparatively higher in control cakes than treated cakes. Saturated fatty acids were reduced as concentration of PB increased in different treatments. Unsaturated fatty acids (Oleic acid and Linoleic acid) were comparatively lower in control cakes than treated cakes. Unsaturated fatty acids were increased as concentration of PB increased in different treatments. Oil stability index of experimental cakes increased up to 1.35% with increasing concentration of PB. Microbial counts were increased with incorporation of Peanut butter due to high % of moisture. Rancidity was gradually lower in experimental cakes than control cakes. Cakes with 40% supplementation of PB had favorable fatty acid composition with substantial oil quality.

Objectives
Preparation of peanut butter
Preparation of cakes in different ratio of vegetable fat to peanut butter
Microbial count of cakes in different ratio of vegetable fat to peanut butter
Biochemical characteristics
Fatty acid profiling

Keywords: cakes, peanut butter, vegetable fat, fatty acid composition, biochemical characteristics, rancidity, microbial count

Introduction
Peanut Produced in India is mainly processed for the oil extraction and it is domestically utilized in Indian diets. Other than this, it is also utilized as raw nuts, Salted nuts, roasted in shell nuts etc. The peanut is also used to produce peanut butter and confectioneries but its share is very little. Peanut butter cookies and cake are also used to make protein concentrate or isolates which is utilized to enrich the protein in cereal based infant or children foods. Peanut could also use to prepare vegetable diet milk as a substitute for animal milk in emergencies.

For the past decade, nutrition scientists have been investigating the role of fat in the diet. They have looked at the different types of fat viz. (saturated and unsaturated) and their effect on health outcomes such as heart disease, cancer, and diabetes. The United States Dietary Guidelines and the American Heart Association (AHA) both emphasize types of fat in the diet. Choose a diet that is low in saturated fat and cholesterol and moderate in total fat [1]. Groundnut is richest source of fatty acid like MUFA which are most use full for heart. Processing of groundnut to its various products will help include peanut butter to improve highly nutritional diet.

Recently, dietary surveys reflect that the majority of children from all socio-economic groups consume cake. The commercial cake is prepared from refined wheat flour (called maida) and it lack in protein quality as well as quantity. The protein content in wheat flour (refined) is around 10% and it is found deficient in lysine, an essential amino acid. Nut and pulses are good sources of protein and are well accepted by majority of Indian population. Among the oilseeds, peanut is the most abundant in India. It is well recognized that effective use of oilseed protein can go a long way towards correction of dietary protein inadequacies.

It may be predicted that the use of peanuts in the form of peanut butter may improve the nutritional status of biscuits as it contributes high quantity of proteins and also essential fatty acids [2]. Peanut butter is semiperishable.

It is not subject to bacterial spoilage and moulds growth. But under very humid conditions it became progressively stale and rancid. The shelf life of peanut butter depends largely upon the quality of peanut used. High grade peanut butter cannot be made from peanuts that were cured at too high temperature, exposed to direct sunrays in 980 F weather or cured at humidity sufficiently high to cause discolouration. Peanut butter contains beneficial mono and poly unsaturated fats. These fats as compared to traditional vanaspati i.e. saturated fats have been shown to help lower blood cholesterol levels and thereby reduce risk of coronary heart disease [3].

Peanut butter deterioration may occur due to the formation of free fatty acids through the splitting of oil molecules. This depends on moisture and on the presence of fat splitting enzymes. Such condition is not found in cake. Secondly the oxidative rancidity develops readily and rapidly at the unsaturated portion of oil when it is exposed to air. Measures for preventing oxidation include; keeping oxygen away from the product through suitable packaging and use of antioxidants, which act as an oxygen acceptor.

"Good fat peanut diet beats low fat diet for heart health" – Article says that besides beneficial unsaturated fats, peanut butter also contains many other heart healthy Nutrients such as vitamin- E, folic acid, soluble fiber, arginine, plant sterols, copper, zinc, selenium, magnesium etc. [4] Indeed, peanut and peanut butter are whole food that contains a variety of vitamin and minerals, ample protein, beneficial unsaturated fats and several phytochemicals. Since they are plant foods, they naturally contain no cholesterol.

Additionally, the types of fat in the ratio of monounsaturated, polyunsaturated and saturate are very important. Keeping in this in to consideration, peanut butter could be one of the best strategies for replacing saturate fat that is Vanaspati in the cake formation which may ultimately be helpful in reducing the risk of heart disease among the cookies consumer.

Materials and Methods

Preparation of Peanutbutter

100 g peanuts(variety "GG-20")were heated at 100°C in hot air oven for 8- 10 minutes and cooled to get uniform roasted product, blanched, peel removed, low weight seeds, discolored seeds or other unnecessary parts were removed. Now this whitens peanut kernel was grind at lower speed in a mixer for 1 to 2 minutes, pinch of salt was mixed in peanut powder which was spread on vessels and kept for 4 to 5 hours till deoiling of peanut powder was noticed. Peanut butter was stored in airtight vessels and kept in cooled condition (14°C).

Preparation of Cakes

Cake prepared with vanaspati to PB ratios of T1 (1:0), T2 (0.8:0.2), T3 (0.6:0.4), T4 (0.4: 0.6), T5 (0.2:0.8), T6 (0: 1) were prepared as per standard recipe (AACC 1994). Oven was preheated to 1800C/3500F/Gas 4. Lightly greased 2 x 20cm/8" sandwich tins Refine flour (150 gm), sugar(120gm), baking powder (4 gm), and peanut butter/ hydrogenated fat (appropriate ratio) were be mixed by using stand mixer or electric hand mixer. The mixture had soft, dropping consistency. The cake batter was added evenly in to the cake tins followed by lightly smooth the surface of the cake and pop them onto the middle shelf of the preheated oven. Cooked for 25 minutes or until the cakes were well risen and golden brown on the surface. Door was opened and cakes were checked by gently pressed centre of the cake. it was spring back easily. Cakes were removed from the oven and placed on a cooling rack for 5 minutes. After 5 minutes the cakes had shrieked away from the sides of the cake tins. Cakes were carefully removed from the tins and cooled it completely on the cooling rack. Cooled cakes were placed onto a plate. The cooled cakes were packed in polypropylene (40 µ thickness) pouches and quality evaluated after 24 h.

Rancidity

Rancidity of experimental cake and raw materials were measured by rancimate 743 (metrohm) as outlined in www.food.metrohm.com. Fat-containing solids – Direct measurement Solids with a high amount of fat, such as nuts and oil seeds (e.g., hazelnuts, almonds, sunflower seeds, sesame seeds, etc.) were measured directly. Crushed and homogenized sample was weighted, e.g., by a mortar.

Moisture Content

Moisture was determined as per method prescribed by A.O.A.C. (1980). For determination of moisture, known weight of maida, peanut butter and experimental cakes were weighed in a previously dried and weighed dish. The dish was placed in hot-air-oven maintained at 105º ± 2º C for about 5 hrs. The dish was covered with lid and cooled in a desiccator and weighed. The dish with dried material was again heated in oven at 105º ± 2º C for 30 minutes. The heating, cooling and weighing steps were repeated till the difference between two successive weighing was less than 1.0 mg. The per cent moisture was calculated as:

$$\text{Moisture per cent} = \frac{100\ (W1 - W2)}{W1\text{-}W}$$

Protein Estimation by Micro-Kjeldahl's Method

Total protein content was estimated by the standard micro-kjeldahlprocedure followed as described below [5].

Known weight (100 mg) of sample was placed into kjeldahl's digestion flask and a pinch of catalyst, 2.0 ml conc. sulphuric acid, few glass bids were added and the mixture was digested for 4 hrs. After cooling minimum quantity of water required to dissolve solids was added and digested mixtures was transferred to the distillation apparatus alongwith washings of digestion flask.To this 10 ml of 40 per cent sodium hydroxide reagent was added and steam distillation was continued until 15 ml distilled was collected, in conical flask containing 5 ml of 4 per cent boric acid and mixed indicator. The collected distillate was diluted if required and titrated against 0.1N hydrochloric acid. Similarly, a blank was run without the sample. Thereafter, nitrogen content was calculated and the same was converted into total protein content by using a factor 5.70 for maida, 5.46 for peanut butter and 6.25 for experimental cakes.

Oil estimation by soxhlet method

The oil content was estimated following the soxhlet method [6]. Weighed 150 ml flat bottomed flask to a constant weight by heating the flask in an oven and was cooled in desiccator. Known weight (10 g) of moisture free sample of maida, peanut butter and experimental cakes were grinded and transferred in to a thimble (whatman), which was placed in the extraction unit. Then, thimble plugged by cotton. 250 ml petroleum ether was added in the flask and arranged the whole assembly in its position and started the heating unit. This was heated for about 8 hrs to extract oil completely. Extract was distilled to remove excess solvent. Then, flask

was cooled and weighed the content. Difference in initial and final weight was provided the oil content of the material, and per cent oil was calculated as-

$$\text{Oil percent} = \frac{\text{Weight of Oil (g)}}{\text{Weight of sample (g)}} \text{ X } 100$$

Microbial Count

Microbial count of raw material [peanut, peanut butter, vanaspati, maida (wheat flour)] and experimental cakes were done by general colony formation unit (CFU) count per gram. Fungal growth study was done using Potato Dextrose Agar (PDA) media and bacterial study was done using Nutritional Agar (NA) media [7].

CFU:-CFU is an estimate viable bacteria or fungal numbers. Unlike direct microscopic count where all cell, dead and living, are counted, CFU estimated viable cells. The appearance of a viable colony required significant growth of the time of counting the colony it is not possible to determine if the colony arose from on cell or 1,000 cells. Therefore, the results are given as CFU/ ml for liquids and CFU / g for solids to reflect this uncertainty.

Fatty Acid Composition

The presence of fatty acid was analyzed after oil extraction by soxhlet method from experimental cakes and raw materials (PB, refined wheat flour). To determine the presence of fatty acid, methyl esters of different oil samples were prepared [8]**.**Known weight (0.250-0.500 g) of fat/oil sample was placed into a screw cap tube and 6 ml of 0.5 M methanolic sodium methoxide was added. It was mixed thoroughly on a vortex mixer and left in 70° C water bath for 10 min for dissolving the fat globules and then cooled at room temperature. To this, 0.5 ml boron trifluoride reagent was added and mixed thoroughly. It was boiled for 10 min. at 70° C in water bath and, then, allowed to cool at room temperature. 2-3 ml hexane and 1 ml HPLC grade distilled water was added. Fromthis tube, about 1 ml of hexane layer (supernatant) was transferred to another test tube and a small amount of anhydrous sodium sulphate was added. Water free hexane containing fatty acids was injected into a Gas chromatography-Mass Spectroscopy (GC-MS, QP 2010 Plus, Shimadzu) and was run for about 30 min. The fatty acids present in the oil samples were identified and quantified using GC condition. The GC parameters were (1) Capillary column: DB-Wax (30m x 0.25 mm x 0.25µM), (2) Injector temperature: 250, (3) Injector split: 1µl (1:50), (4) Column Oven Program: 60ºC→12ºC/min→ 150ºC (1min)→5ºC/min→ 240 ºC (5min) and (5)Column Flow: 1ml/min (He). The MS parameters are 1.Ion source temp: 230ºC, 2.Interface temp: 240oC, 3. Detector Voltage: 0.84kV.

Statistical Analysis

The ANOVA (completely randomized design) method was used for analysis of data related to three times replicated cookies for all parameters.

Results and Discussion

The result (Table 1) for rancidity of the fresh control cakes, induction time was found to be, (13.36 h). This result was decreased with the increase of peanut butter in the cakes. There were significant differences recorded between the experimental cakes (T_1 to T_6treatments).

Table 1: Rancidity Measurements of Experimental Cakes

S. No	Treatments	Mean of induction time At 120ºc (h)	Mean of induction time At 120ºc (h)
1.	(V: PB)	Fresh	After 8 days
2.	T_1 (100:0)	13.66	12.06
3.	T_2 (80:20)	10.45	9.20
4.	T_3(60: 40)	9.84	4.80
5.	T_4 (40: 60)	9.57	4.47
6.	T_5 (20:80)	6.40	4.00
7.	T_6 (0:100)	4.80	3.29
Pooled Mean		9.07	33.35
S.Em.±		0.12	0.14
CD at 5%		0.38	0.43
CV%		2.38	3.84

Fresh and 8 days storage samples are not rancid as such but induction time to get rancidity at 120^0 C gave information about assumption for chances of rancidity occurred in experimental materials.

After 8 days storage, induction time of experimental cakes were decreased in all treatment compared to fresh cookies. This could be due to the deteriorative process started in experimental cakes during storage.

Table 2: Chemical characteristics of raw materials

S. No	Treatments	Mean Moisture (%)	Mean protein (%)	Mean fat (%)
1	Maida	9.7	10.63	1.12
2	Peanut	8.71	26.82	44.67
3	Peanut butter	6.36	24.54	53.50
Pooled mean		8.25	20.66	33.09
S.Em.±		0.40	0.31	1.13
CD at 5 %		1.42	1.10	3.94
CV %		8.49	2.64	5.90

The data on moisture, protein and fat contents in the raw materials prepared with are presented in Table 2. The moisture content in peanut butter was 6.78 per cent which was lower than Maida (9.72 per cent). The values of moisture content in peanut butter differed to the values of 0.2 per cent [9]. and 1.80 and 1.70 per cent for various peanut butters [10].

The proximate composition of peanut butter depends largely on variety of peanut used for making peanut butter; however, peanut products did not always exhibit same composition as peanuts[9]The composition of peanut depends largely on variety, climatic condition and the agricultural practices [11].

Chemical composition of experimental cakes

The data on moisture, protein and fat contents in the control and experimental cakes prepared with the use of vanaspati and peanut butter in different ratio are presented in Table 3. Moisture content was found to be non-significant during T_1 to T_3 treatments (i.e. replacement of 40 per cent vanaspati with peanut butter), however, significantly increased when 60, 80, per cent and 100 per cent of vanaspati was replaced with peanut butter instead of vanaspati (T_4 to T_6 treatments). Protein content in the experimental cakes linearly and significantly increased with the progress of treatments (T_1 to T_6). Total fat decreased significantly with increase in the proportion of peanut butter from T_1 to T_6 treatments excepted, between T_3 and T_4 treatment where no significant difference was observed.

Table 3: Chemical characteristics of control and experimental cakes made with the use of peanut butter and Vanaspati in different ratio

S. No	Treatments (V: PB)	Moisture (%)	Protein (%)	Fat (%)
1	T_1 (100:0)	13.01	6.33	44.03
2	T_2 (80:20)	13.30	7.20	36.0
3	T_3(60: 40)	14.56	7.30	32.97
4	T_4 (40: 60)	14.20	10.14	32.0
5	T_5 (20:80)	16.75	10.40	24.27
6	T_6 (0:100)	18.15	11.09	23.33
Pooled Mean		14.99	8.74	32.05
S.Em.±		0.21	0.22	0.38
CD at 5%		0.65	0.69	1.17
CV%		2.43	4.44	2.04

The moisture content (Fig 4.6A) increased significantly during T_4 to T_6 treatments, which could be due to the high proportion of moisture free vanaspati replaced by peanut butter which contributed some moisture. The control cake (100 per cent vanaspati) contained 6.33 per cent protein and the experimental cakes, prepared with different ratios of vanaspati and peanut butter (i.e. 100:00, 80:20, 60:40, 40:60, 20:80, 00:100), contained protein of 6.33, 7.20, 7.30, 10.14, 10.40 and 11.09 per cent, respectively. These findings of increase in protein content in the experimental cakes with increasing proportion of peanut butter enhanced the nutritive value of cakes [10].

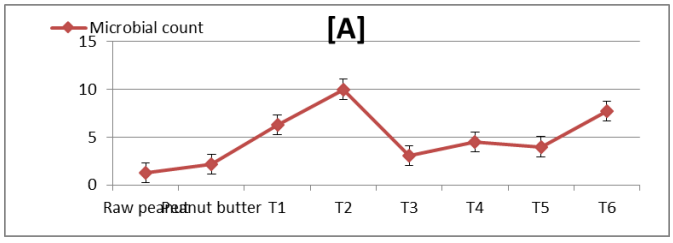
Peanut butter contained approximately 53.50 per cent fat and when it was used to substitute vanaspati (100 per cent fat) in the cake formulation for preparing experimental cakes, there was gradual reduction in the fat contents in the cakes with the progress of treatments. The control cake (100 per cent vanaspati) contained about 44.03 per cent fat and the experimental cakes, prepared with replacement of 20, 40, 60, 80 and 100 per cent vanaspati with equivalent per cent of peanut butter, contained 36.0, 32.97, 32.0, 24.27 and 23.33 per cent fat respectively. These findings of decrease in nutritionally harmful vanaspati with increasing proportion of peanut butter in the experimental cakes would enhance the nutritive value of cakes with simultaneous increase in the protein content.

Nutritive value of haissa and peanut butter supplemented haissa were studied [12]. Peanut butter replaced for 30 and 40 per cent of dates in the basic formula of haissa resulted into increase in the protein content from 3.9 per cent protein in control haissa to 10 and 12 per cent protein in the peanut butter supplemented haissa.

Microbial counts of raw materials and experimental cakes

The microbial count data of the RAW peanut and peanut butter were 1.3×10^4 CFU/g and 2.2×10^4 CFU/gThe result of microbial count fresh cake were (6.31×10^4 CFU/g, 101×10^4 CFU/g, 3.11×10^4 CFU/g, 4.51×10^4 CFU/g, 4.01×10^4 CFU/g, 7.71×10^4 CFU/g) for T_1 to T_6treatments.according to the results of microbial count of fresh cake supplimented with peanut butter, there were highest microbial count (7.7×10^4 CFU/g) was found in T_6 treatment which was prepared by 100 per cent peanut butter. Lowest microbial growth (3.1×10^4 CFU/g) was found in T_3 treatment. The result of microbial count fresh cake were (6.31×10^4 CFU/g, 101×10^4 CFU/g, 3.11×10^4 CFU/g, 4.51×10^4 CFU/g, 4.01×10^4 CFU/g, 7.71×10^4 CFU/g) for T_1 to T_6 treatments (figure 1 A).

Raw materials (raw peanut and peanut butter) and experimental cakes were stored for 8 days at ambient temperature (range temperature was 25^0C humidity) and future microbial count were measured. After 8 days microbial count of raw peanut (Rp) and peanut butter were 5×10^4 CFU/g, 3.6×10^4 CFU/g. In the case of data found of treated cakesafter 8 days there were not similar result were found like fresh cakes. There were highest microbial count (295.45×10^4 CFU/g) was found in control cakes where the 100 per cent vanspati were used for prepared cakes and there were microbial growth were decreased with increase peanut butter. There were significant difference were found between fresh cakes and after 8 days cakes. There were lowest microbial count observed in T_1 treatment (745×10^4 CFU/gm) where 100 per cent vanaspati usedfor preparation of cake. Microbial growth were increased by increasing the proportion of peanut butter.the data found T_2 treatment to T_5 treatment (1601×10^4 CFU/g, 2609×10^4 CFU/g, 3282×10^4 CFU/g, 4714×10^4 CFU/g) (figure 1 B).



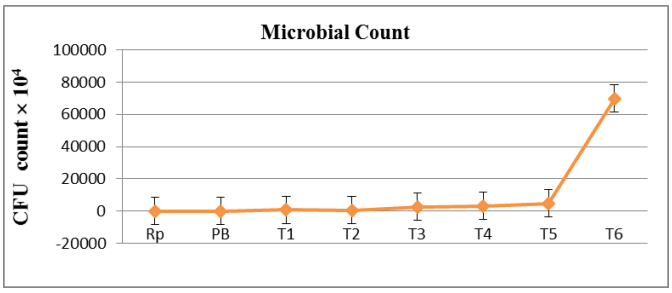


Fig 1: Microbial Count (Cfu.G^{-1}) of Raw Materials and Experimental Cakes [A] Fresh, [B] after 8 Day Storage

Fatty acid composition of raw materials: Fatty acid analysis of vegetable fat showed that it containshighest proportion of total SFA which is (60.61%) followed by 34.51% total MUFA and 2.59% total PUFA (Table 1). Wherever the highest oleic acid was (34.47%) in vegetable fat as in which palmitic acid (44.53%) as SFA and linoleic acid (2.59%) as PUFA, however other fatty acids were recorded in lower concentrations (Table 4). 36.9% oleic acid, 23.7% palmitic acid and 21.1% linoleic acid in vegetable fat were recorded. Change in fatty acid content of vegetable fat was varied based on the amount of vegetable fat used in its production [18].

Fatty acids analysis of peanut butter showed that it contains the highest amount of total MUFA (40.26%), total PUFA (24.13%) and also total SFA (36.00%). Percentage of oleic acid (40.21 %) was greatest in peanut butter than linoleic acid (24.05%) and palmitic acid (23.7%). SFA like palmitic acid and stearic acid were recorded in high proportion significantly ($p < 0.01$) highest in vegetable fat than PB however, MUFA and PUFA like oleic acid and linoleic acid were significantly ($p < 0.01$) highest in PB than that of the vegetable. While refined wheat flour contained only 1 percent fat so its contribution in experimental cookies is not much important. Due to the highest oleic acid (51.6%) followed by linoleic acid (26.2%) in peanut butter it has a high nutritive value than other fats and butter. Content of fatty acids were not similar in products of PB and peanut. It changes with area of production and variety.

Fatty acid composition of cake: Total SFA was highest (69.42%) in control cake which gradually de-creased with increasing proportion of PB cake (Table 5). The lowest SFA (35.37%) were found in T6 treatment wherein entire quantity of vanaspati was replaced by PB. This was due to the high content of SFA in vanaspati and low content in PB.

Study revealed that total SFA was highest (69.42%) in control cakes but as proportion of PB was increased, Total SFA was decreased gradually which is shown in table 2. In treatment $T_6$the amount of vegetable fat was completely reintegrated by PB so percentage of SFA comes to the lowest range (35.37%). The reason was due to the high amount of SFA found in vegetable than PB. In treatment T_3MUFA contentwas found 26.75%, where, 40 % vegetable fat and 60 %peanut butter. In treatment T_4MUFA contentwas found 30.99 % where, 60 % vegetable fat and 40 % peanut butter were added as raw materials to make cakes. In treatment T_6 highest MUFA and total PUFA was found 38.39 % and 25.12% respectively. Where, 100% vegetable fat was back up by PB (Table 5).This was probably due to the high content of PUFA (18.91%) in PB, which was100% used to make T_6 cakes in place of vegetable fat. The ratio of linoleic acid to total SFA is called nutritional quality index which was found 0.32(T_4) against 0.19 (control cakes). The result recorded of major Fatty acids like palmitic, stearic, oleic and linoleic acids, in the Turkish biscuits, which supported the present study.

Peanut butter incorporated cookies contained valuable MUFA and PUFA

MUFA and PUFA are bloodcholesterol lowering fatty acids and so it decreased the hazards effect of coronary heart diseases [13]. In addition it also contains many other nutrients which are beneficial to heart like protein, folic acid, arginine, vitamin E, plant sterols, soluble fiber, copper, zinc, magnesium and selenium [14]. Daily supplement of PB can reduce the disease related to heart by 21% however less fat diet decreased it by 12% [15]. Total cholesterol level can be reduced by 10% and LDL cholesterol by 14% by using PB diets as it contains high MUFA [16].

Table 4: Fatty acid composition of raw materials.

S. No	Fatty acid (% distribution)	Vanaspati	Maida	Raw Peanut	Peanut Butter	Pooled mean	S.Em.±	CD at 5 %	CV %
	A. Saturated fatty acids:								
1.	Lauric acid, C12:0	0.66	0.23	-	0.07	0.32	0.02	0.06	9.55
2.	Myristic acid, $C_{14:0}$	1.95	0.23	0.26	0.22	0.66	0.002	0.05	4.07
3.	Palmitic acid, $C_{16:0}$	44.53	28.43	24.94	23.29	30.29	0.21	0.70	1.22
4.	Stearic acid, $C_{18:0}$	13.04	2.72	5.89	7.28	7.23	0.05	0.16	1.18
5.	Arachidic acid, $C_{20:0}$	0.43	-	1.22	1.98	3.63	0.02	0.06	2.48
6.	Behenic acid, $C_{22:0}$	-	0.33	3.03	3.16	2.17	0.04	0.15	3.45
	B. Monounsaturated fatty acids (MUFA)								
7.	Palmitoleic acid $C_{16:1}$	0.04	0.14	0.32	0.05	0.13	0.01	0.02	9.28
8.	7-Hexadecenoic acid $C_{16:1}$	-	1.61	-	-	1.61	-	-	-
9.	Oleic acid, $C_{18:1}$	34.47	16.48	42.30	40.21	33.36	0.18	0.60	0.95
	C. Polyunsaturated fatty acids (PUFA)								
10.	Linoleic acid, $C_{18:2}$	2.59	46.68	22.20	24.05	23.88	0.18	0.60	1.33
11.	Linolenic acid, $C_{18:3}$	-	3.34	-	0.08	1.71	0.02	0.06	1.57

Table 5: Fatty acid composition of experimental cookies supplemented with peanut butter

S. No	Fatty acid (% distribution)	Treatments						Pooled mean	S. Em.	CD at 5 %	CV%
		T_1	T_2	T_3	T_4	T_5	T_6				
	A. Saturated fatty acids										
2	Lauric acid, $C_{12:0}$	0.56	0.41	1.39	0.64	0.01	-	0.60	0.03	0.08	7.66
3	Myristic acid,$C_{14:0}$	1.91	1.38	1.79	1.44	0.14	0.12	1.13	0.02	0.06	2.91
4	Palmitic acid, $C_{16:0}$	54.69	53.25	48.30	46.85	17.50	17.40	39.66	0.24	0.73	1.04

5	Stearic acid, $C_{18:0}$	12.07	12.03	13.78	10.71	8.54	8.15	10.88	0.06	0.20	1.02
6	Arachidic acid, $C_{20:0}$	0.19	0.45	0.25	0.66	3.75	3.67	1.49	0.02	0.07	2.55
7	Behenic acid, $C_{22:0}$	-	-	-	-	6.49	6.03	6.26	0.04	0.16	1.07
	B. Monounsaturated fatty acids (MUFA)										
8	Palmitoleic acid, C16:1	0.08	0.12	0.18	0.16	0.06	0.10	0.11	0.01	0.02	8.12
9	Oleic acid, $C_{18:1}$	24.76	25.95	26.57	26.58	32.37	26.33	27.09	0.28	0.86	1.77
10	10-Octadecenoic acid (E - oleic acid)	-	-	-	1.84	1.43	1.98	1.75	0.02	0.06	1.60
11	Elaidic acid (E - oleic acid)	-	-	-	2.41	6.38	10.08	6.29	0.20	0.71	5.61
	D. Polyunsaturated fatty acids (PUFA)										
12	Linoleic acid, $C_{18:2}$	3.02	3.55	8.45	7.91	23.87	24.30	11.85	0.07	0.22	1.05
13	Linolenic acid$C_{18:3}$	-	-	-	-	0.06	0.86	0.46	0.01	0.02	2.17

Where; T_1 = Control, V 1: PB 0, T_2 = V 8: PB 2; T_3 =V 6: PB 4;T4 = V 4: PB 6; T5 = V 2: PB 8; T6 = V 0:PB 1.

Conclusion

From Above study we can conclude that the induction time for rancidity were found decreased with increasing incorporation of peanut butter in experimental cakes, indicates product with peanut butter may become rancid fast. The protein, moisture and oil content in cookies increased significantly with increase in proportion of peanut butter, while total fat content decreased with the progress of treatments. Microbial count was observed higher in experimental cakes compared to raw materials particularly after 8 days storage. After 8 days of storage there was the fungus growth found in the cakes. The saturated fatty acids namely; lauric acid, myristic acid, palmitic acid, stearic acid etc. were found higher in control cookies and significantly decreased with increasing proportion of peanut butter in the experimental cookies. This could be beneficial for heart patients. Oleic acid (MUFA) was found lowest in control cookies and it significantly increased when 20 per cent vanaspati was replaced by peanut butter (T_2) followed by non-significant increase for the rest of treatments (T_2 to T_6). Nutritionists give more importance to MUFA contents so as to restrict cardiac problems. Linoleic acid (PUFA) was found lower in control cookies and it significantly increased with incorporation of peanut butter in experimental cookies. This too could be considered beneficial from the nutritionist point of view for controlling atherosclerosis.

Conflict of Interest

Now a days, there are continuously an increase in cardiac disease in human which is majorly cause by intake of saturated fatty acid in our diet. The peanut butter have a high amount of unsaturated fatty acids which is beneficial for human health and it has better nutritional quality so we can decline the risk of cardiac disorder by the replacement of SFAs with the USFAs (unsaturated fatty acids). The main source of peanut butter is groundnut which is the easily available and comparatively cheaper than vegetable ghee.

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