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Comparative evaluation of quality and storage stability of potato chips deep-fried in groundnut and canola oils

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Abstract

Background: The objective of this study was to develop and evaluate the properties of deep-fried groundnut oil and canola oil of potato chips at 180ºC during storage for 0-90 days. The demand for potato chips is still high worldwide. The potato slices were blanched at 90ºC for 5 minutes followed by pre-treatment control: T_1, with NaCl (1%): T_2, KMS (0.5%)+NaCl (1%): T_3, KMS (0.5%)+NaCl (1%)+CA(0.5%): T4, $CaCl_2$ (1%)+NaCl(1%): T_5, and then partially dried at 60ºC for 4 hours fried and compared with control samples. The storage depicted significant increases in mean moisture content and pH while there were decreasing trends in the mean values of ash content and acidity.

Methods: In this field-laboratory investigation during 2020-2023, different treatments of reduced moisture content and attractive golden color are found in this research. In the laboratory, the collected data from a hot air oven, pH meter, Acidity found from titrated value, and sensory evaluation. shown the table of different frying oils and different treatments.

Result: The organoleptic evaluation showed that scores for color, texture, taste, crispiness, and overall acceptability (T_4) fried in groundnut oil except that fried in canola oil, are now just as important to consumer preference as taste, texture, and crispiness, color, and overall acceptability. This study concluded that sensory ratings fell during the 90-day storage period for potato chips that were Fried in groundnut oil and canola oil.

Keywords: Potato chips, frying, storage, quality, sensory

Introduction

Potatoes *(Solanum tuberosum*) are grown in 80% of the countries in the world and are consumed daily by millions of people from diverse cultural backgrounds. Potato chips were invented in 1853, in the USA, and became popular throughout the world. In developing countries such as India, they are the most popular potato product. Deep fat frying is a widespread operation used in food processing industries to prepare tasty and crispy foods—fried potato products are of its largest applications. Potato chips have a unique texture flavor combination, which makes them so desirable in market (Garayo and Moreira, 2002, Mellema, 2003) [22, 23]. Most important quality parameter of potato chips is the amount of fat absorbed during frying and some pre-frying treatments were shown to be effective in reducing oil-absorption. Lowering the moisture content before frying using microwave, hot air and baking resulted in significant reduction in oil content in different products (Lamberg *et al.*, 1990, Moreria and Barrufet, 1999) [24, 25]. In recent years, several procedures have been proposed to reduce the amount of oil uptake such as blanching or drying. The blanching step improves the color and texture and could reduce the oil-uptake by gelatinization of surface starch.(Califano and Calvelo, 1987) [26] Drying leads to lower moisture content and also reduces oil absorption.(Talburt and Smith, 1987) [27]. During frying process, the physical, chemical and sensory characteristics of food are modified. Texture, color and oil uptake are main characteristics or quality parameters of potato chips. Non-starch polysaccharide (NPS), lignin and starch are main texture effecting constituents of the potato.(Andersson *et al.*, 1994) [28].

Potato (*Solanum tuberosum*) is the worldwide famous tuber vegetable. A raw potato contains 79% water, 17% carbohydrates (88% starch), 2% protein, and negligible fat. Raw potato provides 77 calories of energy and is a rich source of Vitamin B6 and Vitamin C (23% and 24% of the daily value, respectively (Arya and Joshi., 2019) [8]. Potatoes are the third main crop for human nutrition that helps combat poverty and malnutrition in developing countries (Marwaha *et al.*, 2010) [9]. The demand for processing potatoes is expected to rise from 2.8 million tons in 2010 to 25 million tons in 2050 (Bandana *et al.*, 2016) [10]. 100g potato chips provide about 547 calories of energy with a fat content of 37.47g, total carbohydrate 49.74g, protein 6.56g alongside Sodium (525mg) and potassium (1642mg). In the food processing industry, deep fat frying is a widespread operation that makes potato chips tasty and crispy. According to (Maity *et al.*, 2014) [11], Frying can also affect the nutritional quality of food because the process is based on high temperatures. This changes the structure of labile nutrients, and some water-soluble molecules and unstable vitamins such as thiamine and riboflavin can be lost by evaporation and degradation, respectively (Bordin *et al.*, 2013) [12].

Over the last forty years there has been a great increase in the consumption of frying fats and oils, following the development of a wide range of new fried and prefried foods. Main reason is that frying is a fast and convenient technique for production of foods with unique sensory properties of color, flavor, texture and palatability, highly appreciated by consumers (Erickson, 1996) [15]. In the case of fried foods that are stored, the deterioration of the oil starts during the frying process, but it continues during storage of the product as a consequence of lipid oxidation, which produces chemical and sensory changes reducing the consumer acceptance. (Che Man and Tan, 1999) [14].

Since ancient times, frying has been a fundamental cooking technique to enhance the taste and texture of food. Traditional frying, which involves immersing food in heated oil at temperatures between 160–180°C, induces significant structural changes and creates appealing flavors in the final product. Due to its unique organoleptic properties, deep frying has gained popularity among consumers of all ages (Hosseini *et al.,* 2016) [1].

However, the safety of deep-fried foods is a major concern, as high frying temperatures lead to various oil degradation processes such as hydrolysis, polymerization, and thermo-oxidation. These reactions produce harmful byproducts that are absorbed by the fried food, posing significant health risks, including cancer, atherosclerosis, liver damage, and cardiovascular disease (Gadiraju *et al*., 2015) [2]. Potato chips, a popular snack for 150 years, are valued for their sensory properties, flavor, texture, and acceptability, often enhanced by salt-based flavorings (Pedreschi and Moyano, 2005) [3].

Potatoes, scientifically known as Solanum tuberosum, belong to the nightshade family (Solanaceae) and are a major starchy tuber crop. The edible potato tuber is rich in carbohydrates, providing a high-energy yield per unit of land, water, and time. Potatoes contain 80% water and 20% solids, with starch comprising 15-18% of their dry mass. A medium-sized potato with skin provides 45% of the daily requirement of Vitamin C, 18% of potassium (more than a banana), and 10% Vitamin B6 (Mumiece *et al.,* 2011). Their chemical composition influences the processing method and is affected by factors such as cultivation area, seed type, soil and climate, agricultural practices, storage conditions, and commercialization (Lenonel *et al.,* 2017). Frying is a food processing technique that involves cooking food in hot oil. The high temperature causes free water evaporation from the potato surface and oil absorption, forming a crispy crust while cooking the food internally. Frying improves texture and flavor, enhancing overall palatability through a heat and mass transfer process involving complex interactions between the food and the frying medium (Vankoerten *et al.,* 2015) [6]. Studies comparing potato chips fried in sunflower, canola, and palm olein oil found varying levels of carcinogenic contaminants, with canola and sunflower oils containing fewer monoglycerides and diglycerides than palm olein oil (Ozdikicierler *et al.,* 2021) [7]. Among the different physical properties of food products, color is considered an important visual attribute for the imperceptions quality of a product. Potato chip color is a vital criterion for industrial potato processing and is strictly related to consumer perception. Among the sensory attributes of potato, texture, aroma, flavor, color, and texture are considered the most important (Rubilar *et al.,* 2012) [13]. Aim of the research was to study Comparative evaluation of quality and storage stability of potato chips deep fried in Groundnut and Canola oil of the most well-known foods in the world, potato chips. Different oils are used in their preparation in various parts of the world, and the authors set out to compare the results in each situation and support their benefits and drawbacks.

Quality of a food product involves maintenance or improvement of its key attributes such as colour, flavour, texture, safety, healthfulness, shelf life and convenience. Snacks are described as a small quantity of food eaten between meals or in place of a meal. Snack food has grown in popularity despite the low-fat/ no-fat health trend (D.P. Houhoula, 2004) [16].

Studies revealed that the type and quality of oils significantly affect the stability of fried foods, as oils undergo oxidation during frying (Xu *et al.,* 2022). Saturated and unsaturated fatty acids affect the degradation of frying oils, and the presence of large amounts of polyunsaturated fatty acids positively correlates with oxidative degradation and affects the antioxidant properties between different fats and oils. To increase oxidative stability during frying, it is recommended to use oils with low levels of unsaturation (Xu *et al.,* 2022, Ioannou *et al.,* 2023) [20]. Thus, understanding oil stability in frying is essential for selecting oils that improve fried food quality (Elaine *et al.*, 2023) [21].

It is imperative that care must be taken in the selection, transport, storage, handling and use of frying oils since any abuse would probably result in reduced product quality and shelf life such as result of rancidity and off-flavour development. To maintain quality, it is important to control microbiological spoilage, enzymatic degradation, and chemical degradation. Components of quality depend upon the composition of the food, processing methods, packaging, and storage (Dominic Man *et al*, 2002) [18].

During the storage of snacks such as potato chips a number of deterioration processes take place together. They are texture loss due to moisture pick up, rancidity development which is due to oxygen /induced-light and gradual loss of flavor (J.B. Rossell, 2001) [17].

The quality of a food product involves maintenance or improvement of its key attributes such as color, flavor, texture, safety, healthfulness, shelf life, and convenience. Snacks are described as a small quantity of food eaten between meals or in place of a meal. Snack food has grown in popularity despite the low-fat/ no-fat health trend (D.P. Houhoula, 2004) [16]. the quality of potato chips. Oil is primarily used as a heat transfer medium during the frying process; it gets absorbed and becomes a major part of the finished product. Ordinary still be significant.

An increase in unsaturated fat leads to an increase in rancidity (Dopico, *et al*, 2000) [29]. The high level (9) 12%) of linolenic acid (18:3) in canola oil has limited the storage stability of snack foods fried in canola oil. Decreasing the 18:3 content of canola oil by hydrogenation has been shown to reduce the accumulation of peroxide values (PV), conjugated dienoic acids (CDA), and total volatiles and the development of rancid and pointy odors and flavors in potato chips during accelerated storage over a 12-d period (Hawrysh, Z.J.,1992). Canola oil is the least saturated oil of all vegetable oils (Vaisey-Genser, 1990; Holden 1990) [30, 31] and should be partially hydrogenated (PH) to be stable enough for frying (Holden, 1990; Stevenson *et al.*, 1984) [31, 33]. Such PH liquid canola oil still would contain much lower levels of saturated fatty acids (Stevenson *et al.,* 1984) [33] than cottonseed oil.

Quite popular also are hydrogenated vegetable oils (soybean, sunflower and rapeseed), Characterized by enhanced thermo-oxidative stability (Kristott, 2003; Rossel,

2003) [34, 35]. Canola oil is an economically important vegetable oil, behind only palm and soybean oil in terms of production and domestic consumption. Canola oil also contains a low amount of saturated fatty acids (<7%) (Ghazani, *et al.*, 2014) [36], Typical oils used for frying include soybean (Warner *et al*., 2006, Karakaya and Simsek, 2011) [37, 39] corn, hazelnut (Simsek, 2011) [39], peanut (Kim *et al* 2015) [40], canola, palm, palm kernel (Mba, *et al.,* 2017, Li *et al.,* 2017) [41], extra virgin olive (Kalogianni *et al* 2010) [43], and olive pomace (Ben Hammouda *et al.,* 2018) [38] oils.

Material and Methods

Fresh potato and different types of oils were purchased from a local market Meerut, (U.P), India. Determination of quality evaluation of potato chips prepared in different oils (Groundnut oil, and Canola oil) was performed on 0 days, 30 days, 60 days and 90 days of the storage period. The sample packets weighed about 100 grams of potato chips fried in different oils and were subjected to quality analysis such as sensory evaluation during the storage period of 90 days.

1. Pre-treatments

T1: Blanching with 90ºC for 5 min,

T2: Blanching with 1%Nacl at 90ºC for 5 min

T3: Blanching with 0.5% KMS + 1.0 % NaCl at 90ºC for 5 min.

T4: Blanching with 0.5% KMS+1% NaCl, + 0.5%CA at 90 °C for 5 min.

T5: Blanching with 1%$Cacl_2$+1% NaCl at 90 °C for 5 min.

2. Proximate analysis of deep-fried chips

Potato chips (raw and deep-fried chips) were analyzed for chemical composition (moisture and ash) by employing the AOAC method (1990). The ash content was determined by incineration at
550ºC by using a muffle furnace (AOAC, 1990) [44]. All measurements were performed in triplicate
to calculate the mean value.

$$Moisture\ (\%) = \frac{W1 - W2}{W1} x\ 100$$

[Equation……….1]. Where, W_1 = weight (g) of sample before drying, W_2 = weight (g) of sample after drying,

$$\text{Ash content (\%)} = \frac{Final\ weight\ of\ ash}{Initial\ weight\ of\ sample} \times 100$$

[Equation…….2].

3. pH

The digital pH meter (Systronics µ pH system - 361) was used to determine the pH of the samples. It had an electrode, which was dipped in standard buffer solution during the measurement of pH. The pH was displayed on the digital display. pH = −log (H^+) [Equation……….3].
Where,
H^+ = hydrogen ion concentration (g/lit)

4. Acidity

The acidity of various samples was determined by using the method recommended by (Ranganna, 2001) A gram sample was dissolved in ml of distilled water and out of this
20 ml liquid was taken and titrated with 0.1 N NaOH using a few drops of phenolphthalein
in the solution as an indicator. The endpoint was judged by the appearance of pink color. The titer value
was noted and the result was calculated as percent total acids using the following equation.

$$Acidity(\%) = \frac{Vol.of\ NaOH\ used(ml) \times Norm\ of\ NaOH \times Equi\ wt.of\ citric\ acid \times 100}{Vol.of\ sample\ (ml) \times 1000}$$

[Equation……….4].

5. StatisticalAnalysis

All the analysis reported in this study was performed in triplicates and data obtained is reported as mean ± standard deviation. One-way ANOVA was used to determine the statistical significance of the results. Duncan means comparison test was applied to determine the difference between the mean values at a significant level of $P<0.05$ using (OPSTAT software CCS, HAU Hisar Haryana India)

Result and Discussion

1. Moisture content and Moisture loss

The Lowest moisture varies in different treatments T1 (3.29%) (Table 1) while the highest moisture loss in T1 (78.92%), is the reverse of moisture content. greatest moisture content T4 (4.15%), lowest moisture loss in T4 treatment. The fact that CA is hygroscopic and has no impact on T1 may account for the maximum moisture content detected in T4. During storage of 0–90 days, the moisture content in treatment T1 steadily increased. Table 1 displays the moisture content; at 90 days of storage, treatment T3 had the greatest moisture (3.16%). Cooked in canola oil, and the lowest was discovered in Treatment T5 (1.77%) at 0 days of storage. Increases in moisture content (T1-T5) were observed in potato chips that had been fried in canola oil and stored for longer periods (from 0 to 90 days).
Considerable increases in moisture content in all of the tests (Sulaiman *et al.*, 2003) [46]. There are numerous significant moisture loss values (p 0.05).

2. Ash Content

In Table 1 data for the ash content of the control was incérasses continuos 0-90 days storage another T5 treatment was reversed to be décrasses ash content from 0-90 days continuously, but other T2, T3, and T4 both steps followed incérasses and decreases at duration 0-90 days storage period of ash content of potato chips fried in groundnut oil. It was found that the ash content in control T1, T2, T3, and T4 incérasses continued during the 0-90 days storage period but in treatment T5 there were increases 0 30 days ash content after that 30-60 it decreased, and again increases 60-90 days storage period of potato chips fried in canola oil. It changed ash content only to be a reason for chemical treatment. Only the control showed a rise in result, which is significant (p0.05) while other processed materials showed a decrease in ash content. While other processed materials showed a decrease in ash content. These findings concur with those of (Izumi and Watada, 1994) [47].

3. Acidity

KMS CA and NaCl pretreated product showed maximum retention of acidic (0.16) whereas control showed least retention. With the case of other potato chips cooked with groundnut oil. The acidic content fluctuates depending on the various treatments, with the highest value being found at 0 days (0.16) and the lowest value being observed during 90 days of storage (0.04) (Table 1). Acidity value changes depending on the various treatments, peaking at 0 days (0.15) and peaking at 90 days after storage (0.10). Th e impact of various pre-treatments on the acidic food' retention while frying in groundnut and canola oil, was more pronounced in T3 and less in T5. The results of the acid content of deep-fried potato chips show that it drastically decreased after 0 days in all treatments, with the largest decreases recorded in T2 and minimal decreases reported in T5. The se outcomes are consistent with those of (Sarabjeet *et al.*, 2011) [48].

4. pH

The results for T1 had the lowest pH value on the 0 days of storage, while T2, T3, T4, and T5 were next in line (Table 1). It increases pH value means decreases the acidic nature of potato chips fried in groundnut oil but increases the basicity nature which has no more time it should prevent bacterial growth and environmental conditions. The pH value changes depending on the various treatments, with the highest value (7.23) being reported after 90 days and the lowest (5.38) after 0 days of storage. The impact of various pre-treatments on pH retention during frying was higher in T3 and lower in T4. The results of the pH value of deep-fried potato chips in canola oil show that there was a sharp rise in it after 0 days in all treatments, with the largest increases recorded in T3 and minimal increases reported in T4. The product that had been pre-treated with NaCl had the highest pH retention (7.23) and the lowest pH retention (5.38). The various treatments have significant ($p < 0.05$) values.

Table 1: Effect of various pre-treatments on the composition of deep-fried and groundnut oil and canola oil potato chips during storage.

	Groundnut oil				**Canola oil**			
Treatments	**Moisture Content**							
	0 days	30 days	60 days	90 days	0 days	30 days	60 days	90 days
T1	3.29±0.12	3.71±0.02	5.55±0.01	7.31±0.00	2.38±0.14	7.77±0.06	8.55±0.00	8.52±0.00
T2	3.58±0.09	4.42±0.03	5.94±0.03	8.54±0.00	2.64±0.14	9.53±0.04	7.82±0.00	7.83±0.00
T3	3.80±0.15	4.24±0.02	5.82±0.00	7.73±0.00	3.16±0.08	9.60±0.02	9.74±0.00	9.81±0.00
T4	4.15±0.12	4.56±0.03	6.34±0.01	8.69±0.00	3.08±0.06	8.92±0.02	8.27±0.00	8.26±0.00
T5	3.30±0.15	4.18±0.04	6.21±0.00	8.61±0.00	1.77±0.08	8.93±0.03	8.77±0.00	9.21±0.00
	Moisture Loss (%)							
T1	78.92	78.50	76.66	74.90	79.83	74.44	73.66	73.69
T2	77.96	77.12	75.60	73.00	78.90	72.01	73.72	73.71
T3	77.39	76.95	75.37	73.46	78.03	71.59	73.60	73.50
T4	77.23	77.32	75.69	72.69	78.30	72.46	73.11	73.12
T5	78.13	77.25	75.22	72.82	79.66	72.50	72.66	72.22
	Ash Content							
T1	0.61±0.02	0.76±0.02	0.99±0.00	1.00±0.00	0.62±0.18	0.76±0.00	0.78±0.00	0.86±0.00
T2	1.19±0.38	1.15±0.01	1.05±0.00	1.14±0.00	0.60±0.14	1.14±0.00	1.16±0.02	1.18±0.00
T3	1.16±009	1.47±0.00	1.09±0.00	1.48±0.00	1.27±0.41	1.38±0.00	1.48±0.00	1.50±0.00
T4	1.03±0.07	1.34±0.01	1.11±0.00	1.11±0.00	1.24±0.14	1.40±0.01	1.48±0.01	1.49±0.00
T5	2.04±0.03	1.61±0.00	1.10±0.00	1.02±0.00	1.48±0.35	1.57±0.00	1.41±0.00	1.43±0.00
	Acidity							
T1	0.09±0.01	0.08±0.01	0.06±0.01	0.04±0.00	0.10±0.01	0.09±0.01	0.08±0.00	0.05±0.00
T2	0.11±0.00	0.10±0.00	0.08±0.01	0.07±0.00	0.15±0.01	0.08±0.02	0.06±0.00	0.05±0.00
T3	0.10±0.00	0.09±0.00	0.07±0.01	0.05±0.00	0.16±0.01	0.13±0.00	0.10±0.40	0.09±0.00
T4	0.21±0.00	0.16±0.03	0.11±0.01	0.09±0.00	0.10±0.01	0.08±0.00	0.07±0.00	0.04±0.01
T5	0.14±0.00	0.11±0.02	0.10±0.00	0.08±0.00	0.08±0.01	0.10±0.02	0.08±0.00	0.10±0.00
	pH							
T1	5.17±0.03	6.14±0.02	6.45±0.02	6.92±0.02	5.46±0.02	6.29±0.02	6.61±0.05	6.70±0.01
T2	6.17±0.01	6.68±0.00	6.72±0.02	6.88±0.02	6.15±0.03	6.18±0.02	6.30±0.04	6.84±0.02
T3	6.03±0.02	6.40±0.00	6.88±0.01	7.19±0.00	5.87±0.01	6.12±0.02	6.25±0.02	7.23±0.01
T4	5.47±0.01	6.12±0.02	6.24±0.03	6.62±0.02	5.38±0.01	5.84±0.02	6.10±0.02	6.36±0.01
T5	5.76±0.02	6.59±0.02	6.73±0.01	6.90±0.00	5.49±0.02	6.32±0.01	6.59±0.01	6.71±0.01

5. Quality evaluation and storage

Table 2 color, texture, taste, crispiness, and overall acceptability highest rating T4, T5, T4 at 0 days, T3, and the overall acceptance rating for deep-fried, pre-treated chips was given between 5.75 to 6.71. Color, texture, taste, crispiness, and acceptability all decline during the storage period (0-90 days) for all treatments. Significant (p 0.05) values exist for the quality evaluation. In Table 3, several pre-treatments are compared in terms of how they affect the sensory qualities of deep-fried canola oil potato chips. The results showed that treatment T4 was preferred by the sensory panelists, who ranked it higher than treatments T5, T3, T2, and T1. For all treatments, color, texture, taste, crispiness, and general acceptability diminish during the storage period (0-90 days). One of the most well-known and extensively used cooking oils is canola oil, which is renowned for having a high level of oxidative stability. These results agreed with those of (Fuller *et al.* 1971) [49] who showed that potato chips fried in CSO had less flavor stability than potato chips fried in high-oleic safflower oil. The quality valuation values are not statistically significant ($p>0.05$).

Table 2: Effect of treatments, frying (180oC in groundnut oil) on the sensory quality of potato chips

Treatments	Parameters																			
	Color				**Texture**				**Taste**				**Crispiness**				**Overall acceptability**			
	0 day	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**
T_1	6.75	6.62	6.37	6.25	6.50	6.25	6.00	5.87	6.37	6.25	6.12	5.87	6.25	6.12	6.12	6.12	6.46	6.31	6.15	6.03
T_2	6.25	6.00	5.75	5.62	6.37	6.12	5.87	5.87	6.50	6.37	6.25	6.12	6.12	6.25	5.87	5.62	6.31	6.18	5.93	5.81
T_3	6.62	6.50	6.25	6.12	6.75	6.50	6.25	5.87	6.25	6.12	5.87	5.75	6.37	6.37	6.25	6.00	6.49	6.37	6.15	5.93
T_4	7.50	7.25	7.12	7.00	6.50	6.37	6.12	5.75	6.62	6.50	6.37	6.12	6.25	6.12	6.00	5.87	6.71	6.56	6.40	6.18
T_5	6.45	6.12	5.87	5.75	6.87	6.62	6.50	6.00	6.25	6.12	6.00	5.50	6.12	6.00	5.87	5.75	6.40	6.21	6.06	5.75

Table 3: Effect of treatments, frying (180^{o}C in Canola oil) on the sensory quality of potato chips

Treatments	Parameters																			
	Color				**Texture**				**Taste**				**Crispiness**				**Overall acceptability**			
	0 day	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**	**0 day**	**30 days**	**60 days**	**90 days**
T_1	6.50	6.25	6.12	5.75	6.25	6.12	6.00	5.87	6.37	6.00	5.75	5.50	6.12	6.12	5.87	5.75	6.31	6.12	5.93	5.71
T_2	6.25	6.12	6.00	6.87	7.00	6.87	6.75	6.62	6.50	6.75	6.75	6.75	7.12	6.50	6.37	6.25	6.71	6.56	6.46	6.62
T_3	6.00	5.87	5.75	5.62	6.50	6.25	6.12	5.75	6.25	6.12	6.00	5.87	6.37	6.37	6.25	6.12	6.28	6.15	6.03	5.84
T_4	7.50	7.37	7.25	7.12	7.12	7.00	6.87	6.87	6.62	7.37	7.25	7.12	7.50	7.12	6.87	6.75	7.18	7.21	7.06	6.96
T_5	6.37	6.12	6.12	6.12	6.12	6.00	5.75	5.62	6.25	6.62	6.50	6.25	6.87	6.25	6.00	5.62	6.40	6.24	6.09	5.90

Conclusion

The current study's findings led to the creation of potato chips with respectable quality attributes. The demand for potato chips is still high worldwide. Future research is necessary to create suitable techniques and processes for blanching and frying to reduce oil content as well as to examine the physicochemical characteristics, and development of quality valuation of potato chips. Many consumers now place a high value on health as a quality dimension, and studies show that health is now just as important to consumer preference as taste, texture, crispiness, color, and overall acceptability. Consumer preferences are based on this dimension because consumers expect products to be of higher quality and last longer. Accordingly, this study concluded that sensory ratings fell during the 90-day storage period for potato chips that were fried in groundnut oil and canola oil.

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