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Sensory Evaluationof Samosas and Potato Chips Fried in Different Sunflower Oils With and Without Butylated Hydroxytoluene

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Abstract

This study was designed to examine the effect of frying in different sunflower oils and impact of antioxidant (butylated hydroxytoluene, BHT) on the sensory quality of samosas and potato chips. The sensory scores for colour, flavour, texture and overall acceptability were found to be higher for the foods fried in laboratory refined sunflower oil than the commercially refined sunflower oil. Use of antioxidant produced significant effect on the sensory quality of the fried food. The foods fried in oils added with BHT got higher scores for colour, flavour, texture and overall acceptability than the foods fried in sunflower oil were ranked significantly higher for colour, flavour, texture and overall acceptability scores than the potato chips fried in commercially refined sunflower oil and similarly the samosas fried in laboratory refined sunflower got significantly higher scores for sensory quality parameters than the samosas fried in commercially refined sunflower oil. The potato chips and samosas fried in sunflower oils added with BHT got significantly higher scores for colour, flavour texture and overall acceptability than the potato chips and samosas fried in sunflower oils used without BHT.

Key Words: Sensory evaluation, Potato chips, BHT, Sun flower oil

Introduction

Frying is one of the oldest methods known to human kind for preparing food. For decades, consumers have desired deep-fat fried products because of their unique flavour-texture combination, ranging from potato chips, French fries, doughnuts, extruded snack, fish sticks and traditional fried products. The aim of deep-fat frying is to seal the food by immersing it in hot oil so that all the flavours and juices are retained in a crisp crust. The technology was originated and developed at the Mediterranean area due to the influence of olive oil (Varela *et al*., 1988).

The quality of the products from deep-fat frying depends not only on the frying conditions but also on the type of oils and foods used during the process. Oils play a dual role in the preparation of fried foods because they serve as a heat transfer medium between the food and the fryer, and they also contribute to the food's texture and flavour characteristics. In deep-fat frying of foods, the temperature of the heated oil, the frying time, and the fryer type are factors that affect the process. The chemical composition of the frying oils, the physical and physico-chemical constants, and the presence of additives also influence the frying process (Varela *et al*., 1988). Additives like antioxidants have al marked effect on the palatability, digestibility, and metabolic utilization of a fried food.

For fried snack foods, surface appearance and texture are the most significant factors for acceptability. A desirable frying oil must be low in free fatty acids and polar compounds, and have a high breakdown resistance during continuous use. Hence, a through understanding of oil degradation and the effects of degraded oil on the quality of final products is important. Frying oils degrade with continuous use. The type of oil used and time for which the oil has been used for frying affect the desired flavour of fried foods. The method still most often used in different countries to discard frying oils is sensory evaluation (Melton *et al*., 1994). In general, the frying industry monitors product quality by how it looks, tastes and smells. The appearance of the fried product is monitored by colour charts and taste panels.

There are lots of steps involved in the commercial refining process that produce oils without and pronounced flavour and taste but the oil should contribute the typical frying flavour. The typical frying flavour is affected by the amount of linolenic and linoleic acid present in the oil (Warner *et al*., 1977). In commercially refined oils linolenic and linoleic acids are rapidly oxidized at frying

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temperature, which might be due to loss of natural antioxidants during deodorization process which is carried out at elevated temperatures (Karabulut *et al*., 2005).

The present study was undertaken to investigate the effect of frying in different sunflower oils and impact of antioxidant (BHT) on the sensory quality of samosas and potato chips.

Materials and Methods

Two types of sunflower oils were taken i.e., commercially refined sunflower oil (Kisan sunflower oil) and laboratory refined sunflower oil (deodorization process was omitted during refining) extracted and refined at Oil Technology Laboratory, AARI, Faisalabad, more or less of similar composition.

The potatoes were sliced after proper washing and cleaning into 0.1 cm thick slices. The samosas, a traditional fried food in Indo-Pak, were prepared by using the formula given as: boiled potatoes Kg; cabbage 2Kg; onion e Kg; fresh Peas 1 Kg; lentils 1 Kg; common salt 100G; black Pepper 100G; green chilies 100G; dried coriander 50G and cumin 50G. The mixture was wrapped in a sheath of wheat flour dough (0.1 cm thickness). The average weight of each samosa was kept 60-65G.

The antioxidant, butylated hydroxytoluene (BHT) was used @ 0.01% to study the effect of antioxidant on the sensory quality of fried food.

The sunflower oil (7.5L) was taken in an open voke of 12L capacity. The food to oil ratio was kept 1:6 (Thorner, 1973) during the whole process of frying at a temperature of 185-190°C. The oil was first heated at frying temperature and freshly prepared samosas or potato chips were pored and allowed to frying till proper light brown colour was developed (Sanchez-Muniz *et al*., 1993). The frying time was set for seven minutes for potato chips and eight minutes for samosas, as determined in a pretest.

The potato chips were fried in oils till a light brown colour appeared, up to 70th number of frying. After every 5th frying, the samosas and potato chips were evaluated for sensory quality.

The fatty acids were converted to their respective methyl esters prior to analysis by Gas Chromatograph (GC) model 3900 Varian USA. The oil samples (50 μL) were methylated in 4mL KOH (I.M) for one hour at room temperature (Xu *et al*., 1999). The resultant fatty acid methyl esters (FAME)were extracted with High Performance Liquid Chromatography grade hexane and analyzed by GC immediately using a fused capillary column 9WCOT fused Silica 30mX0.25mm coating CPWAX52CBDF = 0.25 μM, CP8713), a flame ionization detector (FID) and nitrogen gas as carrier (3.5 mL/Min).GC split ratio was 100%. Injector and detector temperature were 260°C and column oven temperature was 222°C for 7.5 minutes. FAMEs were injected manually. The fatty acids were identified by chromatographic retention time by comparison with standards (Supelco, USA)

A five member analytical sensory panel trained and experienced in evaluating fried foods, was conducted between 11.00 A.M. to 1.00 P.M. daily for fourteen days. Each panelist first received hot samosas/potato chips from four of the eight treatments evaluated those and received the rest four treatments after a two minute break. Panelists were asked to clean their palates with warm water after each testing.

The samosas and potato chips were evaluated for sensory parameters such as colour, flavour, texture and overall acceptability on a 9-point hedonic scale described by Xu *et al*. (1999).

Data from physico-chemical analysis and sensory evaluation were analyzed statistically using analysis of variance and Duncan's Multiple Range test by following the methods described by Steel *et al*. (1997).

Results and Discussion

The fatty acid composition of the laboratory and commercially refined sunflower oils has been presented in Table I. Both the sunflower oils were medium oleic acid and higher in linoleic acid. Traces of Linolenic acid were present in the commercially refined sunflower oil as shown in Table I.

The results pertaining to sensory evaluation of the fried products in different sunflower oils have been mentioned in Table II.

The samosas and potato chips were evaluated by rating on a nine point hedonic scale where, score level 5, was mentioned neither like nor dislike hence score level up to 6 was decided to be acceptable by the panel of judges. It is obvious from the data presented in Table II that the scores assigned to colour were recorded to be significantly higher for the products fried in sunflower oils, when data for frying objects, antioxidant and number of fryings were combined. The colour scores assigned to potato chips fried in sunflower oils were found to be significantly higher than the scores assigned to colour of samosas fried in sunflower oils, when results for sunflower oils, antioxidants and number of fryings were pooled. The products fried in sunflower oils with antioxidants also got significantly higher scores for colour as compared to the products fried in sunflower oils in which no antioxidant was used on pooling the data of all other variables i.e., sunflower oils, frying objects and number of fryings.

The results further demonstrated that the judges assigned significantly lower scores to products with increase in number of fryings irrespective of type of the product. The colour scores ranged between 4.75±0.07 to 7.37±0.07 among different fried products.

The frying temperatures cause the fat to oxidize, resulting in the earlier tendency towards foaming, a definite darkening in the colour and noticeable increase in the fat's tendency to smoke. As the fat gets darker with increase in number of fryings, the foods fried in it, becomes darker at a more rapid rate, eventually reaching the point where the food may be too dark in colour or not be completely cooked (Braverman, 1962). Same trend was observed during the present studies as colour score of the food decreased significantly with the number of fryings for both sunflower oils. The comparison showed that colour scores of the products fried in laboratory refined sunflower oils when antioxidant was used. These results are supported by the findings of Goburdhun and Jhuree (1995), who stated that oils treated with antioxidants showed least changes in the colour of fried food i. e, had the lightest colour at the end of the frying period. The foods fried in oils treated with antioxidant showed overall higher range of number of fryings for acceptability in colour than foods fried in oils without antioxidant. These observations are in line with the findings of Friedman (2000), reported that sensory quality of the food diminishes each hour and each day the oil is used but the degradation rate is affected by the presence of antioxidant.

The flavour scores given to the products fried in laboratory refined sunflower oils were significantly higher than that of fried in commercially refined sunflower oils, when data frying objects, antioxidants and number of fryings were combined. Potato chips fried in sunflower oils got significantly higher flavour scores than the scores assigned to flavour of samosas fried in sunflower oils, when results for sunflower oils, antioxidants and number of fryings were pooled. The products prepared in sunflower oils with the use of antioxidants got significantly higher scores as compared to the products fried in sunflower oils without the use of antioxidant on pooling the data of all other variables i.e., sunflower oils, frying objects and number of fryings.

The results further demonstrated that the judges assigned significantly lower flavour scores to the products with increase in number of fryings irrespective of type of products. The flavour scores ranged between 4.72±0.09 to 7.35±0.07 among different fried products. During the present studies, the foods fried in oils treated with antioxidant, were ranked better for flavour than the foods fried in oils without the use of antioxidant. The use of BHT (antioxidant) protected the oils from oxidation of flavour producing agents in the oils for more number of frying. These results are supported by the findings of Goburdhun and Jhurree (1995) and Gustafsson *et al*. (1993), who stated that oils treated with antioxidant showed the least changes in colour and flavour at the end of the frying period. Similar findings were also reported by Melton *et al*. (1994).

The results in Table II indicated non-significantly different texture scores for the products fried in laboratory and commercially refined sunflower oils, when data for frying objects, antioxidants and number of fryings were combined. The texture scores assigned to potato chips fried in sunflower oils were significantly higher from the texture scores assigned to samosas fried in sunflower oils, when results for sunflower oils, antioxidants, and number of fryings were pooled. The products fried in sunflower oils with antioxidants got significantly higher scores as compared to the products fried in sunflower oils in which no antioxidant was used, on pooling the data of all other variables i. e., sunflower oils, frying objects and number of fryings. The judges assigned significantly lower texture scores to products with increase in number of fryings irrespective of type of the fried product. The texture score ranged between 4.70±0.08 to 7.32±0.07 among different number of fryings.

The texture score was not affected significantly by the type of sunflower oils but it was the effect of frying objects, use of antioxidant and number of fryings for which texture score differed significantly ($P<0.05$). A similar effect was noticed by Xu *et al*. (1999), that there was no significant difference in greasiness or crispiness (texture) between the oils which all showed similar effects. The fried food takes on an undesirable appearance i. e., gray, dull and uneven colour with the increasing frying time (Braverman, 1962; Warner and Mounts, 1993; and Warner *et al*., 1997). The texture score decreased significantly ($P<0.05$) with the number of fryings during the present studies and these results are in line with above findings. It is quite evident from the statistical analysis that texture score was affected by the use of antioxidant. A similar effect was noticed by Allam and Hani (2002), that butylated hydroxyanisole and butylated hydroxytoluene have the synergistic effect on the natural antioxidants, which help in the stability of the oil by checking the polymerization ultimately the viscosity and peroxidation of the oil, which tends to improve the texture of the food.

The results in Table II for overall acceptability scores revealed that the products fried in laboratory refined sunflower oils got significantly higher overall acceptability scores than that of fried in commercially refined sunflower oils, when data for frying objects, antioxidants and number of fryings were combined. The overall acceptability scores assigned to potato chips fried in sunflower oils were significantly higher than the overall acceptability scores assigned to samosas fried in sunflower oils, when results for sunflower oils, antioxidants and number of fryings were pooled. The products prepared in sunflower oils used with antioxidants got significantly higher scores as compared to the products fried in sunflower oils in which no antioxidant was used, on pooling the data of all other variables i. e., sunflower oils, frying objects, and number of fryings. A gradual decrease in overall acceptability scores was observed with the increments in number of fryings. The overall acceptability scores ranged between 4.57±0.08 to 7.25±0.06 among different fried products.

During the present study, the overall acceptability scores followed a gradual decreasing pattern both for laboratory and commercially refined sunflower oils fried food. Warner *et al*. (1994), reported that the fluctuations in overall quality scores pooled over all oil types showed the initially lower quality of chips fried in fresh oil, followed by an increase in quality for 3h chips and a decrease in scores at the beginning of frying on day two but in the present study a continuous decrease in overall acceptability was observed. The present results are in contrary with Xu *et al*. (1999). They stated that scores for taste and overall acceptability did not change significantly during frying, indicating that all the oils of six different composition maintained high taste and flavour stability over 80h deep frying.

Since scores for colour, flavour and texture of fried food decreased gradually with the number of frying in present studies, and obviously the overall acceptability scores should also decrease through the course of deep frying. This variation in results for overall acceptability score might be due to the oils and food (especially samosas) used of different composition and different frying conditions than those of Warner *et al*. (1994) and Xu *et al* . (1999).

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Table I. Major Fatty Acid Profiles of different Sunflower Oils before Deep Frying

Fatty Acids	Laboratory Refined Sunflower oil	Commercially Refined Sunflower Oil
Palmitic Acid (%)	5.36	4.44
Stearic Acid (%)	2.15	1.76
Oleic Acid (%)	29.69	30.40
Linoleic Acid (%)	57.01	55.48
Linolenic Acid (%)	0.00	0.84

Table II. Sensory Evaluation of the Food Products Fried in different Sunflower oils

Parameters	Sunflower Oils		Fried Objects		Antioxidants	
	Laboratory Refined	Commercially Refined	Samosas	Potato chips	Without	With
Colour Scores	6.22 ±0.05 b	6.36 ±0.05 a	6.28 ±0.05 b	6.40 ±0.05 a	6.20 ±0.06 b	6.38 ±0.04 a
Flavour Scores	6.12 ±0.05 b	6.37 ±0.05 a	6.17 ±0.05 b	6.33 ±0.05 a	6.12 ±0.06 b	6.38 ±0.04 a
Texture Scores	6.23 ±0.05b a	6.25 ±0.05 a	6.22 ±0.05 b	6.26 ±0.05 a	6.16 ±0.05 b	6.32 ±0.04 a
Overall Acceptability Scores	6.09 ±0.05 b	6.87 ±0.05 a	6.11 ±0.05 b	6.20 ±0.05 a	6.11 ±0.06 b	6.20 ±0.04 a

*Same letters in a row indicate non-significant means values