



Quality of Potato Chips Fried in Different Oils

KEYWORDS

Quality of Potato chips

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ABSTRACT The present study attempted to produce potato chips in different oils (Sunflower oil, Gingelly oil, Rice bran oil, Corn oil, Palm oil, Groundnut oil and Coconut oil) and to evaluate the keeping quality of potato chips during the storage period of 45 days. The quality parameters such as Sensory analysis, Microbiological analysis, Nutrient analysis, Rancidity and Trans fat changes were performed on 7th day, 14th day, 24th day, 34th day and 45th day of the storage period. The study revealed that potato chips prepared in corn oil and rice bran oil holds good in all quality parameters and there was an excellent sensory scores, decreased microbial count, decreased nutrient change, absence of rancidity and trans fatty acid changes during the storage period of 45 days.

INTRODUCTION

Quality is an attribute or a property which is a measure of excellence, attribute are ascribable by a subject, where as properties are possessible. Maintaining the quality of food is a key requirement in any food manufacturing process, because food consumers are susceptible to any form of contamination that may occur during the manufacturing process. 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).

Snack products are consumed principally for pleasure, because of their unique texture and wide-range availability of flavours. Fat or oil used for frying often determines the acceptability of food prepared with them. As such, well planned and conducted consumer acceptability tests, in the form of appropriate sensory analysis and other chemical and microbial contamination are an important part of the quality and shelf-life evaluation of any snack products (Lawless, 1995).

There are various factors that affect 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 potato chips contain 35-40 per cent of edible oil, even in reduced-fat chips; the level of oil can still be significant. Commonly, in all fried snack foods fat is added as a processing agent. All fats are subjected to deterioration by oxidative and hydrolytic rancidity, which is the major mode of deterioration of all fried snack foods. Increase in unsaturated fat leads to increase in rancidity (Dopico et al, 2000).

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.

The second mode of deterioration of dry-fried snack foods is moisture; shelf life study of products flavoured with salt, exotic spices should include relevant microbiological examination, particularly during product development (Dominic Man et al, 2002).

Quality attributes of foods are influenced by ingredient, tech-

nology, processing, packaging and storage. As an indication of oil degradation one can measure the free fatty acid level in the oil. Determination of free fatty acid level is a useful check, as it is an objective measurement of quality parameters. 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 flavour (J.B.Rossell, 2001).

In recent years much research has been concentrated on the development of food products that have good quality and shelf life. In an effort to examine the best keeping quality of potato chips and to analyze the physical, chemical and microbiological changes, this study helps to determine quality of potato chips in order to make consumers aware about the quality of the products by which health hazards can be prevented.

GENERAL OBJECTIVES

1. To prepare the potato chips using different oils such as Sunflower oil, Rice bran oil, Groundnut oil, Gingelly oil, Coconut oil, Corn oil and Palm oil.
2. To find out the quality of potato chips fried in different oils during the storage period of 45 days.
3. To compare the quality of potato chips fried in different oils during the period of 45 days.

MATERIALS AND METHODS

Mature potatoes which are used especially to fry potato chips were procured from the market (Chennai). The Potatoes were washed, peeled and cut into slices with the following dimensions; length 16 cm and thickness – 0.1 inch. Determination of quality evaluation of potato chips prepared in different oils (Sunflower oil, Rice bran oil, Groundnut oil, Gingelly oil, Coconut oil, Corn oil and Palm oil) were performed on 7th day, 14th day, 24th day, 34th day and 45th day of the storage period. The sample packets weighed about 100 grams of potato chips fried in different oils was subjected to quality analysis such as sensory evaluation, microbiological analysis, nutrient analysis, presence or absence of rancidity and trans fatty acid, during the storage period of 45 days.

PREPARATION OF POTATO CHIPS:

Potatoes were cleaned, washed and sliced evenly about 0.1 inch thickness and length 16cm in order to prepare the chips. The evenly sliced potatoes were fried in different oils, according to the smoking temperature of different oil respectively. Smoking temperature of different oils are: sunflower oil- 227°C, gingelly oil-223°C, rice bran oil-254°C, corn oil-160°C, palm oil-235°C, groundnut oil -162°C and coconut

oil- 232°C. The fried potato chips were filtered in a perforated vessel in order to drain out excess oil, which was cooled for 20 minutes and packed in polythene films. The sample packets weighed about 100 grams of potato chips prepared in different oils were packed hygienically and sealed by impulse sealer. The same procedure was carried out for preparing potato chips in other oils.

TOTAL PREPARATION TIME: 8hours, **TOTAL AMOUNT OF POTATOES USED TO PREPARE POTATO CHIPS:** 45 kg, **QUANTITY PER PORTION:** 100 grams, **TOTAL QUANTITY OF POTATO CHIPS:** 17.5 kg. A total of 175 samples of potato chips prepared in different oils were subjected to sensory evaluation, microbial analysis, nutrient c, presence or absence of rancidity and trans fatty acid, during the storage period of 7th day, 14th day, 24th day, 34th day and 45th day.

SENSORY EVALUATION

A group of 20 panel members agreed to participate as panel members were purposively selected among adolescent girls, for determining the acceptability scores of potato chips fried in different oils during the storage period of 45 days. A validated score card was used to collect information, evaluation was done on the basis of taste, texture, colour, flavour and appearance on 5 point hedonic scale where 5 is 'like extremely' and 1 is 'poor'

MICROBIOLOGICAL EVALUATION

Each sample of potato chips prepared in different oils were subjected to microbial analysis during the storage period of 7th day, 14th day, 24th day, 34th day and 45th day. Determination of presence or absence of microbial invasion was analyzed by total aerobic count/bacterial count for bacteria and fungi. Test for specific organism such as Escherichia coli, Salmonella, Pseudomonas aeruginos and Staphylococcus aureus were performed in order to specify the invaded organism (British Pharmacopeia, 2007).

NUTRIENT ANALYSIS

The nutrient content such as Carbohydrate, Protein, Fat and Energy value of potato chips prepared in different oils were analyzed on 7th day, 14th day, 24th day, 34th day and 45th day. The estimation of carbohydrate content was carried out by Gravimetry method, protein content was analysed by Kjeldhal method and the fat content was estimated by using Solvent extraction method (British Pharmacopeia, 2007).

RANCIDITY ANALYSIS

The presence or absence of rancidity in the potato chips prepared in different oils was analysed by Gas chromatography, during the storage period of 7th day, 14th day, 24th day, 34th day and 45th day (British Pharmacopeia, 2007).

TRANS FAT ANALYSIS

The presence or absence of trans fatty acid was examined by Fourier – Transform Infrared Spectroscopy (FTIR), during the storage period of 7th day, 14th day, 24th day, 34th day and 45th day (British Pharmacopeia, 2007).

STATISTICAL ANALYSIS:

Percentages were used to compute the acceptability score of the sensory parameters. Mean, standard deviation, ANOVA s Duncan's – multi range test and wilcoxon signed rank test was used to analyze the data statistically.

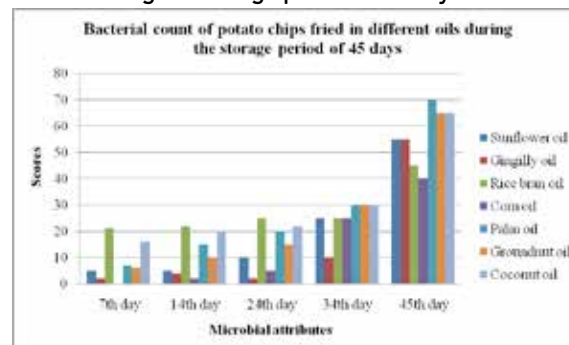
RESULTS & DISCUSSION

Comparing the quality attributes of the potato chips, there is significant changes in the parameters during the storage period of 45 days

Sensory changes : The study revealed that there was a significant difference of 1% ($p < 0.01\%$) in overall acceptability score of potato chips prepared in different oils during the storage period of 45 days. The Duncan's multi range test indicated that potato chips prepared in corn oil ranked the best on 7th, 14th and 45th day and potato chips prepared in rice bran oil ranked the best on 24th and 34th day. From this it is inferred

that rice bran oil and corn oil used in the preparation of potato chips were accepted the best oils when compared with other oil used in the preparation potato chips, during the storage period of 45 days. The results was correlated with a study where the suitability to examine chemical parameters and sensory parameters in setting standards for deep fried snacks (muruku, chekodi and potato chips). The organoleptic evaluation of all the three fried snacks revealed that there is no consistent pattern for the three parameters viz., odor, taste and overall acceptability, except for chekodi (Paddmaja R.etal, 2001). The present study reveals there is a consistent change in overall acceptability of potato chips prepared in different oils.

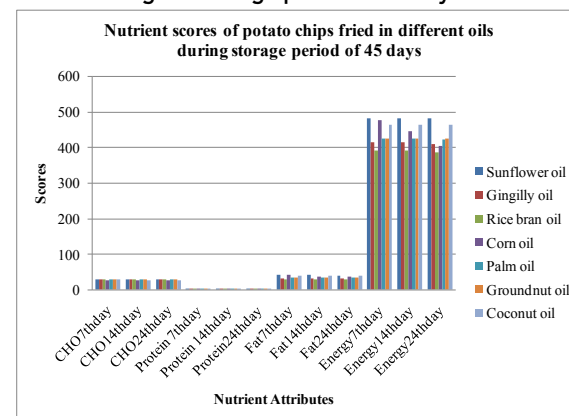
FIGURE 1: Bacterial count of potato chips fried in different oils during the storage period of 45 days



Microbial changes: The result of the microbiological analysis revealed that there was a significant difference of 1% ($p < 0.01\%$) in bacterial count on 7th day, 14th day, 24th day, 34th day and 45th day (figure1). The microbial analysis indicated that there is no specific organism development but there is only presence of bacterial count in the analyzed samples.

The Duncan's multi range test inferred that there is less number of bacterial counts present in potato chips fried in corn oil on 7th day, 14th day and 45th day, whereas potato chips fried in gingilly oil inferred less bacterial count on 24th and 34th day. Thus it is known that corn oil used in preparation of potato chips holds good in quality in terms of decreased microbial contamination. The present study was correlated with effects of drying method, packaging, and temperature during storage on thin slices of fried red Azershrahr variety onion were investigated. During the storage time the moisture content, peroxide value, vitamin C content, total microbial count (TMC), and organoleptic characteristics of the samples were analyzed every for 2 months. The results of microbial analyses indicated that after 6 months all of the samples had higher TMCs than the permission limits so the expiration date was set before that (Asefi.N, 2010)

FIGURE 2: Nutrient scores of potato chips fried in different oils during the storage period of 45 days



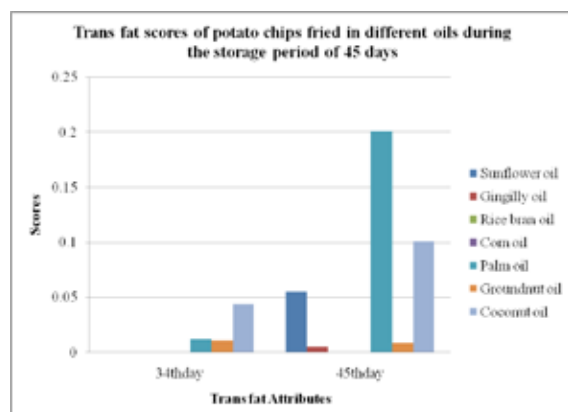
Nutrient changes : The study revealed that the nutrient con-

tent such as carbohydrate, protein, fat and energy value of potato chips fried in different oils was significant at 1% ($p < 0.01\%$). As there was only slight changes in the nutrient content further investigation on 34th day and 45th day was not performed.

The Duncan's multi range test indicated that potato chips prepared in corn and rice bran oil was good in nutrient content of carbohydrate, protein, fat and energy when compared with other oils used in fried potato chips (figure 2). The study was correlated with changes in fat content and storage stability of potato chips fried in different oils. The investigations proved that after six months of storage there is a significant change in fat content (Kaman et al, 2008).

Rancidity changes: The study revealed that there was absence of rancidity changes in potato chips prepared in different oils on 7th day, 14th day and 24th day. The study inferred that there is presence of rancidity in potato chips prepared in palm oil on 34th day where it was 5% significant ($p < 0.05\%$) and was not significant in other oils. There is also significant difference of 5% ($p < 0.05\%$) in potato chips prepared in gingelly, groundnut and coconut oil on 45th day, whereas was not significant in other oils. The present study was correlated with extent of deterioration of potato chips during storage. The extent of deterioration of potato chips was correlated with the oxidation indexes of frying oils. Investigations proved that the rate of increase were higher for frying temperature and longer process time, correlated linearly with oxidation indexes of frying oil (D.P.Houhoula, 2004).

FIGURE 3: Trans fat scores of potato chips fried in different oils during the storage period of 45 days.



Trans fat changes: The study revealed that there was absence of trans fatty acid changes in potato chips prepared in different oils on 7th day, 14th day and 24th day. It was indicated that there was 1% ($p < 0.01\%$) significant difference on 34th day and 45th day of potato chips prepared in different oils. Analysis was completely based only on the existence of Trans fatty acids, the quantity and measurement analysis were not studied.

The Duncan's multi range test inferred that potato chips fried in rice bran oil and corn oil had no presence of trans fat changes during the storage period of 45 days, when compared with other oils used in preparation of potato chips. The present study was correlated with fat extracted from potato chips fried in extra virgin olive oil, high oleic sunflower oil. Investigations proved that there is a significant presence of trans fatty acids in potato chips fried in different oils (A.Romero, 2000).

CONCLUSION

Quality is not an aim in itself, but is desired because it helps to satisfy purchase motives or values. Health is a quality dimension that has become very important to many consumers, and a number of studies indicate that, today, health is as important as taste, and that consumers form preferences based on this dimension motivated by expectations of both a longer life and one of higher quality. Thus, in this study it was concluded that, among the potato chips fried in seven different oils (sunflower oil, gingelly oil, rice bran oil, corn oil, palm oil, groundnut oil and coconut oil), Rice bran oil and Corn oil was exceptional in quality parameters projecting excellent sensory scores, decreased microbial count, decreased nutrient changes, absence of rancidity changes and trans fatty acid changes during the storage period of 45 days.

Awareness programs on reading labels, quality check, snacking and healthy eating habits are a necessity among the public, in order to prevent various infection induced diseases. As the manufacturers do not specify the date of production and the type of oil used, it is recommended that they should specify the date of production and the type of oil used for safe consumption of food. When compared with the other oils (sunflower oil, gingelly oil, palm oil, groundnut oil and coconut oil) Rice bran oil and Corn oil holds good in all quality parameters, it is suggested that in order to satisfy consumer preference, manufactures can make use of rice bran oil and corn oil in the preparation of quality products.

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