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Sensory Qualities of sesame oil, palm olein and the blend of them during frying of potato chips

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ABSTRACT: The study was planned to investigate the sensory characteristics of sesame oil, palm olein and the blend of them in the ratio of 50: 50 (%v/v) during the frying of potato chips. A total of 8 trained panelists evaluated samples based on their crispness, aroma, flavor and overall acceptability. Results showed that the samples for sesame oil had weaker sensory characteristics comparing to palm olein. Also, The samples of palm olein had the highest scores in aroma and flavor while blended oil had the highest scores for crispness and overall acceptability. Meanwhile, the sensory attributes of potatoes fried in blended oil were significantly better than sesame oil. According to the obtained results, blending sesame oil with palm olein is a suitable way to improve the sensory characteristics of the potatoes fried in sesame oil. However, mixing sesame oil with palm olein could provide the usage of antioxidant properties of sesame oil and its healthy effects in the oil blend to produce healthy products with lower cost.

***Keywords*:** Sesame oil, Palm olein, Blending, Sensory characteristic, potato chips

INTRODUCTION

Deep fat frying is extensively used in food processing both industrially and at home, and fried potato products are one of its largest applications due to the high demand of consumers all over the world (Pedreschi, 2007).

Fats and oils have different compounds which are present in low concentrations. Some of these trace materials, including tocoferols, phospholids, carotenoids and sterols increase oil stability during frying (Chung, 2004). Sesame seed and its oil contains substantial amounts of unique components called lignans (sesamin sesamolin), which play an important role in promoting health. Sesamin and sesamolin have been reported to have many bioactive properties, e.g. antioxidant activity, antiproliferative activity, lowering cholesterol levels, and showing antihypertensive effects and neuro protective effects against hypoxia or brain damage (Rangkadilok, 2010). Apart from sesame lignans, sesame seed and oil also contain other important biologically active compounds, such as vitamin E (tocopherol homologues) (Williamson, 2008). Tocopherol has many beneficial properties, such as antiproliferative effects in human cancer cells. Anti-inflammatory activity and partial prevention of age-associated transcriptional changes in heart and brain of mice (Rangkadilok, 2010). The sesame oil is very stable due to the presence of the previously mentioned antioxidants, therefore, it has a long shelf-life and can be blended with less stable vegetable oils to improve their stability and longevity (Kochhar, 2002). But, In spite of useful nutritious characteristics of sesame oil and its healthy effects, its high price causes limitation for using this useful oil in industry and also at homes.

Recently, palm oil is recognized as second and most common usable herbal oil in all over the world which is the cheapest, comparing to other edible oils (Siddique, 2010). Palm olein the liquid fraction of palm oil is one of the popular vegetable oils used for potato chips and French fries (Pedreschi and Zuniga., 2009). Palm olein has been shown as highly monounsaturated oil, which is rich in oleic acids (Nor Aini, 1993), is currently touted to be oxidatively stable. This oil is suitable oil for frying, it has less iodine value and therefore less amounts of poly unsaturated fatty acids (Idris, 1992). Palm olein, besides being marketed as liquid oil, can be promoted for blending with other edible oils (Lin, 2002). This is because its moderately low linoleic acid content is admirably suited for blending with oils of high poly unsaturated fatty acid.

During frying, complicated changes such as physical, chemical and organoleptical properties (taste and odor) were occurred in oil that have a direct effect on quality and health of food (Kazami, 2005; Mackay, 2000). Acrylamide has been classified as a probable carcinogen by the International Agency for Research on Cancer (IARC, 1994) and exposure to high levels having been found to cause damage to nervous system (Lopachin, 2004). The detection of surprisingly high levels of acrylamide in fried or toasted potato and cereal products in April 2002 provoked extensive international research, which progressed rapidly (Svensson, 2003). These processed foodstuffs are widely consumed and shown to be extremely susceptible to acrylamide formation by the Maillard reaction, mainly due to the abundant presence of the free amino acid asparagines and of reducing sugars (Stadler, 2004). In most foods, reducing sugars are the main carbonyl compounds reacting with free asparagines since their level is usually very high. Nevertheless, carbonyl compounds in foods may arise also from lipid oxidation, particularly during heating (Frankel, 1998). It has been stated that formation of acrylamide by oils is due to the reaction between carbonyl compounds derived from lipid thermoxidation products with free asparagine of potato (Hidalgo and Zamora, 2007; Capuano, 2010), so, the choice of suitable frying oil that has naturally high thermo oxidative stability can reduce the amount of acrylamide in fried potato products (Ehling, 2006; Capuano, 2010; Bakhtiary, 2013). Previous findings by Bakhtiary, (2013) about determination of the amount of acrylamide formation during frying of potato in sesame oil, palm olein and the blend of them, showed that sesame oil generated the least concentration of acrylamide in potato chips, while palm olein generated the highest. They recommended that using sesame oil which has high thermoxidative stability for frying of potato chips leads to produce more safer and healthier potato chips than palm olein.

In addition, during frying, oil is not only act as a heat transfer, but also it interacts with proteins and carbohydrates in the food matrix and induces favorable odor and taste. Also, brownish color of food makes donate the suitable appearance to foods which promote the appetite. For consumers, the perceivable sensory attributes are the deciding factors in food acceptance (Pal, 1995). Sensory evaluation is considered to be an important analytical tool in the present day competitive corporate environment. Measuring the sensory properties, and determining the importance of these properties, as a basis for predicting acceptance by the consumer represent major accomplishments for sensory evaluation (Bodyfelt, 1988). The fact that differences exist among frying oils/fats on the sensory quality of fried foods is not disputed (Gulla & Waghray., 2012), but it has been stated that blending oils can improve characteristics of stability and sensory factors as seen by Handoo, (1994) who reported that organoleptically attributes of cottonseed, mustard and corn oil were different and organoleptically 70:30 blend of cottonseed-mustard had greater acceptability than corn-mustard. Similar studies were done and reported by Handoo, (1992a) on groundnut- cottonseed and by Handoo, (1992b) on sunflower-mustard oil blends, and groundnut-cottonseed oil blends and by Waghray and Gulla (2010) in mustard and corn oil.

Blending has long been used to modify oils and fats to improve the fat functionalities and thus optimize their application in food products. It modifies the physicochemical properties of oils without changing their chemical composition (Chu and Kung, 1997). With the rising demand of natural products and emphasis on nutritional enrichment, blending of vegetable oils and fats has emerged as an economical way to produce edible oils devoid of any chemical treatment and which possess natural flavor and characteristics as well as nutritional value (Kochhar, 2002). In a recent paper, Abdulkarim, (2010) investigated the physicochemical and sensorial characteristics of palm olein, sesame oil and their mixture at varying ratios. They claimed that thermoxidative stability of sesame oil was more than palm olein and when sesame oil was added to palm olein in different ratios, the stability of oil blends were significantly higher than palm olein. Sensory evaluation was conducted on the banana chips. They showed that samples fried in 90% palm olein-10% sesame oil scored highest in aroma, and flavor while 70% palm

olein-30% sesame oil had the highest score for crispness and control (100% palm olein) had the highest score for overall acceptability, although none of the differences were statistically significant.

Bakhtiary, (2013) determined the amount of acrylamide formation in potatoes fried in sesame oil-palm olein blend of 50:50 (%v/v) significantly lower than palm olein. They recommended that using blend of sesame oil with palm olein in proper ratios leads to produce more safer potato chips than palm olein.

According to this fact that for choosing food, sensory qualities are more important than high nutritional value for consumer 's satisfaction, in this paper the sensory characteristics of palm olein, sesame oil and their mixture were evaluated during the frying of potato chips.

MATERIALS AND METHODS

Materials

For this research 10 kg of Agria potatoes were purchased from Seed and Plant Improvement Institute of Iran and stored at $10^{\circ}C$ until preparing chips. For frying these samples, two different kinds of edible oils of plant origin were used in this study. Refined, bleached and deodorized palm olein and sesame oil void of synthetic antioxidants were purchased from Behshahr factory.

Sensory evaluation

Peeled Agria potatoes approximately 1/5 mm in thickness were sliced using a mechanical slicer (Italimport SRL, Model 90915, China). Three liter of each oil examined including sesame oil, palm olein and their mixture in the ratio of 50:50 (%v/v) was used as frying medium to fry potato chips (batches of 100g) at $180^{\circ}C$ for 4/15 minutes. The potato chips kept at room temperature for 5 min, placed on kitchen Rolland paper towels to remove surplus oil and later stored in an air tight glass bottles and labeled. The sensory quality of the potato chips was evaluated based on their crispness, aroma, flavor and overall acceptability by using 10-point hedonic scale, where 1= dislike extremely and 10= like extremely by 8 trained panelists.

Statistical Analysis

The experiments were carried out in the completely randomized design (CRD) in triplicates. The average was compared with each other by Duncan method. Analysis of variance (ANOVA) and comparison of averages was done by SPSS 16.0 software.

RESULTS AND DISCUSSION

Results of this study showed that significant ($p< 0.05$) differences occurred in the sensory characteristics of potato chips fried in the different frying oils (H1). Also, there was significant ($p< 0.05$) differences between the sensory characteristics of potato chips fried in blended oil with sesame oil and palm olein (H2). The samples made with Palm olein had the highest scores for flavor and aroma (Figures 1, 2) while blended oil scored highest in crispness and overall acceptability (Figures 3, 4). This result was similar to previous findings by Abdulkarim, (2010).

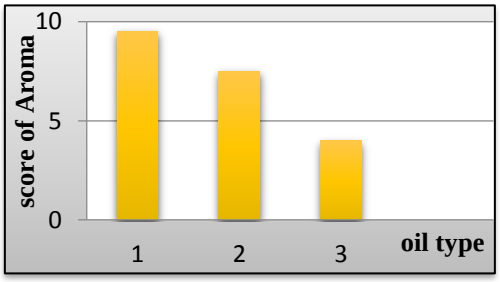

Figure 1. Average of aroma in fried potatoes in (1= palm olein, 2= blended oil, 3= sesame oil)

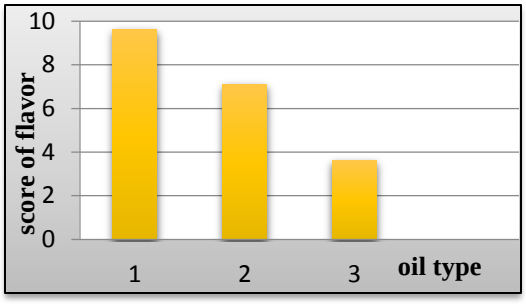

Figure 2. Average of flavor in fried potatoes in (1= palm olein, 2= blended oil, 3= sesame oil)

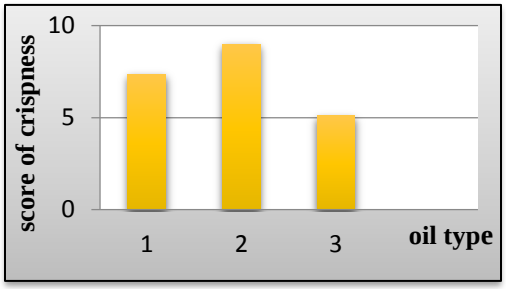

Figure 3. Average of crispness in fried potatoes in (1= palm olein, 2= blended oil, 3= sesame oil)

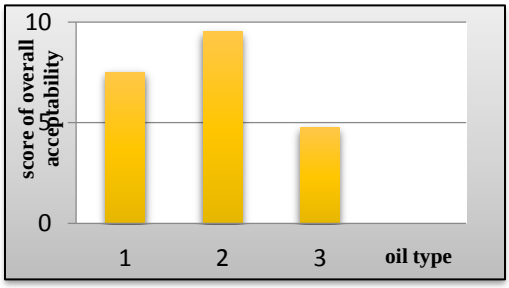

Figure 4. Average of overall acceptability in fried potatoes in (1= palm olein, 2= blended oil, 3= sesame oil)

According to the obtained results, the fried potatoes in Sesame oil had the least sensory scores for four attributes (crispness, aroma, flavor and overall acceptability). Moreover, as shown in figures 1, 2, 3 and 4 the sensorial characteristics of the samples fried in blended oil were significantly better than sesame oil. result confirm previous finding by Waghray and Gulla (2011) who reported that organoleptically 80:20 and 20:80 blends of sesame oil- palm olein had greater acceptability than the sesame oil.

It has been already stated that sesame oil comparing to palm olein is more suitable frying oil for preparing healthy potato chips containing the lower acrylamide concentration (Bakhtiary, 2013), but, the results of this study showed that the sensorial quality of potatoes fried in sesame oil is significantly weaker than palm olein for panellists.

Also, in the recent paper by Bakhtiary, (2013), blending sesame oil with palm olein in the ratio of 50:50 (%v/v) led to reduce the concentration of acrylamide much lower than palm olein due to the presence of natural and powerful antioxidants of sesame oil in blended oil and its effect on improving thermoxidative stability of oil blend. They claimed that using sesame oil-palm olein blend for frying of potato chips could lead to produce more healthier product with lesser acrylamide formation comparing to palm olein. Meanwhile, the results of sensory evaluation of potatoes fried with sesame oil-palm olein blend of 50:50 (%v/v) appeared to be more acceptable for panelists than sesame oil.

CONCLUSIONS

It can be concluded that simple blending of natural oils can help to achieve desired characteristics of sensory factors and health of food.

Although that sesame oil could lead to produce more healthier product than palm olein but potatoes fried in sesame oil had weaker sensory characteristics comparing to palm olein. Meanwhile, the results of sensory evaluation of the potatoes fried in sesame oil-palm olein blend appeared to be more desirable for panelists in crispness and overall acceptability than each of palm olein and sesame oil. Therefore, blending sesame oil with palm olein in the ratio of 50:50 (%v/v) is recommended as a suitable way for preparing healthy potato chips with more acceptable sensory attributes for consumers.

However, proper blending of sesame oil with palm olein in optimal proportions can provide the usage of antioxidant properties of sesame oil and its healthy effects in the oil blends with lower cost.

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