POTENTIAL USES OF PEANUT OIL AND ITS MEAL

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ABSTRACT

Peanut is widely spread in Egypt, especially all the reclaimed areas in which it shows a high yield crop. Peanut kernels contain abou 50% oil which upon extraction leads to a moderate price oil. the extracted peanut oil stability as measured by the Rancimat test, was 21.5 hours at 100°C. Peanut oil used for frying for up to 24 hours was less abused than the continuous heating which showed high deteriorations in refractve index, peroxide value and the polar substances.

The recorded panel taste score of (9.0) showed that the fried potato chips for up to 12 hours had a golden colour, favourable taste, crispy, and crunchy. The peanut flavour was not retained at the frying temperature.

The prepared dipping salad had a high palatiblity for its pleasant teste, colour and the homogenized texture.

The prepared peanut cookies had a new unusual sweet peanut taste and flavour which had a high score for the overall acceptablity.

Key words: Peanut oil-Oxidation stability-Frying-Heating.

INTRODUCTION

Peanut or groundnut is one of the most widespread and potentially important food legumes in the world (Coffelt, 1989). As an edible oil crop, the peanut competes with sesame, sunflower and soybean.

Peanut oil can be used in cooking, fuel and as a food constituent. Peanut meal is an excellent source of protein to balance diets high in cereal and starchy foods, and as a substitute for animal proteins.

The whole peanut is rich in proten (26%), minerals and vitamins (2.7%) and has about 42 to 52% oil and 24% carbohydrates. Most of the world production is processed to oil (Coffelt, 1989).

Peanut oil has a high flash point and does not retain flavours durng cooking, making it a good favoured cooking oil. Peanut oil is a desirable cooking and salad oil because of its high quality.

It contains about 80% unsaturated fatty acids such as oleic and linoleic acids (Ahmed and Young, 1982). Peanut oil has a better keeping quality than soybean, corn and safflowere oil because it is a good source of tocopherols (Hashim *et al.*, 1993).

Peanut meal is more concentrated than whole peanuts in protein, minerals and vitamins. It is used as an excellent source of protein to balance diets high in cereal and starchy foods (Coffelt, 1989). The various products from peanut meal can be used to alleviate hunger and malnutrition in many developing countries.

Moreover, peanut flour has been used to replace part of wheat flour or corn meal in making various types of bread and other bakery products (Coffelt, 1989 and Mohamed et al., 1995).

The goal of food technologist is related to main points: 1) Developing new products of high quality. 2) good in nutrition and health concepts (low fat L.F and high protein HP) and 3) Diversty of uses.

The objectives of this study were to determine the potental uses of peanut oil and the overall acceptability of the fried potato chips and the palatability of using peanut meal in making tahina (dipping salad) and peanut cookes.

MATERIALS AND METHODS

1. Materials

1.a. Nine Kg of unshelled raw peanuts were purchased from a private local market at Helwan region. They were heated in an oven at 100^{o}C for 15 min, then grounded in an electric mill (National). Peanut oil was obtained by pressing the crushed peanuts in an electric hydraulic press Carver at 2400 pound/cm2. It was dehydrated using unhydrous sodium sulphate and then filtered. The collected oil was kept in clean dry and brown bottles at 5^{o}C until its usage for frying or heating.

1.b. Ten Kg of potatoes purchased from a local market. These potatoes were peeled, washed with tap water, sliced into thin chips using a special slicer.

2. Methods:

2.1. Frying process: A round pan of 25 cm diameter and 3 liters of extracted peanut oil were used. The frying periods were 3 hours daily at 180°C ±5°C for 8 consecutive days. The frying oils were sampled daily in brown bottles and stored in deep freezer untill analyzed. The rest of oil was allowed to cool to room temperature overnight. The frying and cooling processes were repeated until the frying oil had been used for 8 days and a total of 24 hours.

2.2. Heating process: One liter of extracted peanut oil was used for heating only using the same conditons of frying as previously mentoned.

2.3. Oil analysis :

The frying and heated oil samples as well as the non-treated oil (control) were subjected to the followng analyses:

Acid value, peroxide value (meq/Kg), polar compounds, and refractive index according to the methods reported by the AOCS (1985).

Determnation of shelf life (measurng oxdative stablty) of the control oil using the Rancimat Metrohm 679 as descrbed by Frank, *et al* (1982).

2.4. Recipe of tahina (dipping salad) 200 g of peanut meal, 50 g corn oil were blended wth hot water and seasonings of vinwgar, garlic,salt cumin were used.

2.5. Sweet cookies were prpared using the fowng ingedents, 150 g of wheat flour, 150 g of peanut meal 100 g of sugar, 10 g butter and 10 ml orange juce or water (Adbel Menem, 1982).

2.6 Sensory evaluaton of the fried chips was carred out according to Vickers (1982). Also, Panel test was carred out to record the overall acceptability of the tahina salad and the peanut cookes. The results were statstcally analyzed at the central laboratory for design and Statistical Anaysis Research, Scientific Computation Section. A.R.C.

2.7 Moisture and oil content of the peanut kernels were determned accrding to AOCS (1985).

RESULTS AND DISCUSSIN

Various vegetabe oils are ussed for deep fat fryng of food prducts. The price, avaiabity, and oil characeristice are major cnsiderations when selectng an oil. Peanut is wdespread in Egypt (102224 feddans), especiaans), especially all the new reclaimed areas (67936 feddans) n which it shows a high yieds crop (125988 tons), (CAAE, 1996-1997). The oil characteristcs are used to meas its potential use as an edible oil in salad cooking and fryng.

The first data obtained for peanut kernel analysis were: 6.77% moisture cntent, 50.23% exracted oil and 1.38% oil in the remained pressed meal. The extracted peanut oil stabilitymeasured by the Rancimat test was 21.5 hours at 100 ^{o} C. This result f high xidative stability could be due to the fatty acid cmpositon, which is low in 18:3 (0.03%) and high in oleic 18:1 (56%), as referred by O'Keefe *et al.*, (1993).Also, peanut oil is a good source f tocopherols (Hashim *et al.*,1993).

The refractive ndex in Table 2 shwo an increase by increaseing the heatng time. This may be attributed to formatin of high molecular weight materials (polymerized cmpounds) Johnsn and Kummerow, (1957). Moreoover, it is obvious that the heated oils had more deterioation and the increase in refactive index raised from 1.4699 for the fresh oil to 1.4720 after 24 hrs of frying, while a sharp increase to 1.4780 occured in the heated oil at 180± 5^{o}C. This observation was noticed by Aziz (1982) and was explained as the potato moisture is converted into vapour formng a layer on the surface of the oil and protects it from atmospheric oxygen. The values of refractive index in table 2 and the polar compounds in table 4 are in good correlaton. The polar content raised from 5.99% in the fresh oil (control) to 19.44% after 24 hrs of frying and 23.26% for the heated oil. These data show the importance of continuus frying involving the conversion of potato moisture into vapour carrying off many of the volatile compuonds formed in the oil and decrease the accumulation of compounds which could polymerize into nonvolatile of high molecular weigh compounds in the frying oil (Aziz, 1982). Thus, the continuous frying for up to 24 hrs at 180^{o}C is less deleterioas than the continuous heating which show high deteriorations.

As it can be seen from Table 1, the acid value of the frying peanut oil like refractive index and polar compounds, was found to increase gradually compared to the heating oil treatment for up to 21 hours and then sharp increase in the heating oil treatment occured compared to the frying oil which had lower values.

In contrast to the aforementioned results, peroxide values in table 3 reveal a different trend due to the breakdwn of the formed oxidative compounds to aldehydes and ketones which are responsible for the change in taste and smell (Kopp, 1973). The fryng peanut ol reached a high peroxide value of 26.32 meq/kg after 15 hrs of frying and then the volatile oxidative compounds escaped with the steam vapour and decreased to 19.14 meq/Kg after 24 hrs. On the otherhand, the heatng of peanut oil increased its peroxide value gradually to 10.93 after 21 hrs followed by a sharp decrease of these oxidative compounds to 5.95 meq/Kg. From these data, it could be concluded that peanut oil is suitable for frying for up to 15 hrs. Moreover, peroxide value is of great imprtance to follow up the extent of peroxides and oxidative compounds breakdown. Also, the changes in oil characterstics such as acid value, peroxide value, refractive index and the formed polar materials are of great importance to follow the deterioration of the frying oil and to evaluate its potential use as an edible frying oil for food stuffs, (Aziz 1982; Kun 1988; Gray 1978; Graziano 1979; White 1991 and Allam 1994).

Mearwhile, our results are in good agreement with thos of Du Plessis *et al.*, (1981) who found that the peanut oil used in frying for up to 20 hrs had free acids and peroxide values increase at a lower rate compared to cottonsed oil which increasd rapidly. And the results of Kpp, (1973) who found that heating and frying of peanut and sunflower seed oils, for up to 30 hrs were safe.

Firestone *et al.*, (1991) collected the regulations of frying fats and oils in different countries. They are summarized for their highest values in the following table:

Country	Acid Value %	Polar compounds %
Austria	2.5	27
Belgium	2.5	25
Germany	--	27
Japan	2.5	--
The Netherlands	4.5	16
Switzerland	--	27

Sensory evaluation

The fried potato chips, tahina salad and the peanut cookies were subjected to seensory evaluation by 10 volunteers who have an interest in tasting foods.

The obtained results are presented in Table 5. A scale of 1-10 was used to evaluate each character. The higher the number the better the quality.

The recorded scores (9.00) show that the fried chps in oil usd for up to 12 hours of frying had a golden colour and a favourable flavour. The potato chips fried at 15 and until 21 hours decreased gradually in their crispness when chewed, as well as the colour had black spots and lost their golden colour. The recorded scores (3.50) for the chips fried till 21hours had a greasy flavour, slightly hard texture, and dark colour. The most important notice for the taste panel is that the peanut flavour was not retained at such frying temperature.

The prepard tahina salad had a higher palatablty (9.23) for its pleasant taste, odour and the homogenized texture. Also, the added seasomings and spices hid the peanut flavour.

Th prepared peanut cookies had a new sweet panut flavour which revealed a high score (9.37) for the over ıll acceptability.

Uses of panut oil and its meal:

The following chart summarize the different products and by-products of peanut kernels and their usages.

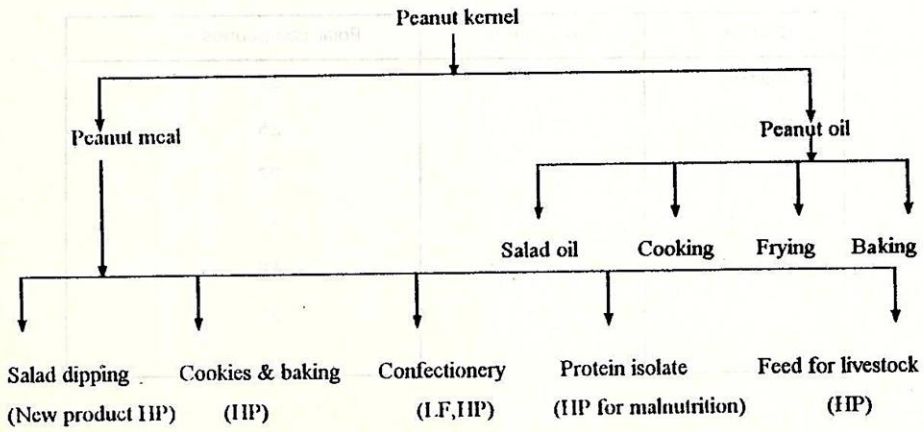

Table 1. Changes in acid value of peanut oil during heating and frying at 180 ± 5°C.

Treatment	Time of treatment in hours								
	Zero	3	6	9	12	15	18	21	24
Heating	0.55	0.72	1.04	1.28	1.40	1.61	2.22	2.28	2.61
Frying	0.55	0.69	1.20	1.32	1.36	1.46	1.51	2.22	2.63

Table 2. Changes in refractive index of peanut oil during heating and frying at 180 ± 5°C.

Treatment	Time of treatment in hours								
	Zero	3	6	9	12	15	18	21	24
Heating	1.4699	1.4104	1.4703	1.4709	1.4712	1.4716	1.4738	1.4740	1.4780
Frying	1.4699	1.4700	1.4701	1.4702	1.4708	1.4710	1.4712	1.4718	1.4720

Table 3. Changes in perxide value (meq/kg) of peanut oil during heating and frying at 180 ± 5°C.

Treatment	Time of treatment in hours								
	Zero	3	6	9	12	15	18	21	24
Heating	3.45	3.97	4.31	4.80	4.86	5.36	7.75	10.93	5.95
Frying	3.45	13.51	15.63	16.95	17.76	26.32	25.33	22.96	19.14

Table 4. Changes in % polar components of peanut oil during heating and frying at 180 ± 5°C.

Treatment	Time of treatment in hours				
	Zero	6	12	18	24
Heating	5.99	7.43	10.88	12.55	23.26
Frying	5.99	8.69	12.56	15.93	19.44

Table 5 a). Sensory evaluation of the fried potato chips in peanut oil.

Frying time (hrs)	Characteristics (Means)				Overall
	Crispy	Crunchy	Colour	Flavour	Palatability
3	1.90^{a}	2.00^{a}	3.00^{a}	3.00^{a}	9.90
6	1.90^{a}	1.90^{ab}	3.00^{a}	3.00^{a}	9.80
9	1.80^{a}	1.70^{ab}	3.00^{a}	3.00^{a}	9.50
12	1.80^{a}	1.60^{b}	2.80^{ab}	2.80^{a}	9.00
15	0.90^{b}	1.20^{c}	2.50^{b}	2.30^{b}	6.90
18	0.70^{b}	1.00^{cd}	1.60^{c}	1.30^{c}	4.60
21	0.70^{b}	0.70^{de}	1.40^{c}	0.70^{d}	3.50
24	0.60^{b}	0.40^{e}	0.60^{d}	0.60^{d}	2.20
LSD	0.36	0.356	0.353	0.337	---

b) Overall acceptability of Tahina (dipping salad) and cookies made of peanut meal .

Characteristics (Tahina)	Means	±SD	Cookies	Means	± SD
Texture (homogenized)	2.93	0.15	Texture → Crunchy	0.92	0.107
			Texture → Soft	0.90	0.11
Taste → Favourable	1.92	0.16	Taste → Pleasant	2.84	0.22
Taste → peanut	0.91	0.14	Taste → peanut	1.90	0.22
odour	1.77	0.39	odour	2.81	0.207
Appearance	1.70	0.46	---	---	--
Overall palatability	9.23	---	Overall palatability	9.37	---

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إمكانية استخدام زيت وكسب الفول السودانى

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يعتبر محصول الفول السوداني من المحاصيل واسع الانتشار في مصر حيث تجود زراعته خاصة في اراضي الاستصلاح الزواعي والمناطق الصحراوية معطيا محصول وفير. وتحتوي بذور الفول السوداني علي حوالي ٥٠٪ زيت مما يجعل استخلاص الزيت منه اقتصادي.

تم قياس درجة ثبات زيت الفول السوداني علي جهاز ال Rancimat وكانت النتيجة ٢١,٥ ساع مقدر علي درج حرارة ١٠٠ ° م.

وعند استخدام زيت الفول السوداني في عمليتي تسخين وتحمير لمدة ٢٤ ساعة اظهرت النتائج ان الزيت المستخدم في التحمير لمدة ٢٤ ساعة كان أقل تدهور عن الزيت المستخن لنفس ذة المدة عن طريق قياس معامل الانكسار ورقم البيروكسيد وتكوين المركبا القطبيه.

كما اوضحت نتائج التذوق الحسي(٩٠٠ درجات) المسجلة للبطاطس المحمرة في الزيت المستخدم حتي ١٢ساعة انها ذات لون ذبي ونكهتها مستحبة وقوامها مقرمش وهش مع ملاحظة اختفاء النكهة الخاصه بالفول السوداني علي درجات حرارة التحمير.

تم تحضير سلاطه Salad-dip والتي كان لا قابلية عالية للونها وطعمها المستحب ولتجانس قوامها.

وباحلال كسب الفول السوداني جزئيا محل الدقيق في صناعه البسكويت وجد ان البسكويت المصنع من كسب الفول السوداني ذو طعم حلو مميز لنكهه الفول حيث سجل درجة قابلية عالية.