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Quality Evaluation of Canola Oil During Deep Fat Frying of Potato Chips

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Abstract

A trial was conducted to study the quality evaluation of Canola oil during deep fat frying of potato chips in the Department of Chemistry. Various physical and chemical parameters of the fried oil were determined. The results revealed that specific gravity, refractive index, viscosity, acid value, saponification value and peroxide value increased with frying time. Iodine value decreased with increasing frying time during frying of potato chips. The results concluded that we should avoid extensive heating and indiscriminate frying as much as possible if we want to secure our health.

Introduction

Fats and oils are one of the major class of food products. Oils may be defined as greasy to touch and are liquids at room temperature while fats are solid at room temperature. Frying oils are prepared oils and with exception of Virgin olive oil they are alkali, refined, bleached, winterized if necessary deorderized. Deep fat frying is a process in which substances are deep fried. Deep frying is chosen for rapid food preparation and for producing the flavour of fried food (Mancini-Filho *et al.*, 1986). During the deep fat frying small particles of the food material being fried often fall off or break off and are left behind in the frying fat.

Canola oil (*Brassica napus*) is genetically improved rapeseed with low levels of erucic acid (less than 2 percentage of total fatty acid) and glucosinolates (less than 30 μ moles/g of oil free dry meal (Shahidi and Gabon, 1989). It is a newly marketed vegetable oil for use in cooking and in salads that contains 55 per cent of the monounsaturated fatty acid, oleic acid, 25 per cent linoleic acid and 10 per cent alpha linolenate (Polyunsaturated fatty acid (PUFA) and only 4 percent of the saturated fatty acid (SFAS) that have been implicated as factors in hypercholesterolemia. Canola oil is the most widely food oil in Canada and has been approved for generally recognized as safe (GRAS) Status by the Food and Drug Administration (FDA) of the United States Department of Health and Human Services (Dupont *et al.*, 1989).

Keeping in view the significance of Canola oil as for edible purposes, the present project was undertaken to study the effect of deep-frying on the quality of Canola oil.

Materials and Methods

Canola oil was procured from the Utility Store. The research work was carried cut in the Department of Chemistry, University of Agriculture, Faisalabad.

Physical characteristics: Physical characteristics of Canola oil such as specific gravity, refractive index, and viscosity were determined.

Chemical characteristics: Chemical characteristics such as acid value, saponification value, iodine value, and peroxide value were determined.

The potato chips were fried in oil at 200 ± 5° C in an open non stick pan for 5 hours. During frying the oil samples (150 ml approximately) were collected after 1, 2, 3, 3½, 4, 4½ and 5 hours and analysed for the physical and chemical analysis to evaluate the changes caused by frying. Besides the samples of different time intervals the original samples and come-up temperature (11.9 minutes) were also analyzed. The observation for each heating time was recorded in triplicate. Data obtained was then subjected to appropriate statistical analysis by the method of Steel and Torrie (1992). Each sample was analysed for the physical and chemical characteristics according to the standard methods (A.O.A.C., 1990).

Results and Discussion

The results pertaining to physical characteristics are shown in Table 1. The results showed that physical characteristics, i.e., specific gravity, refractive index, viscosity of each sample increased with increasing time period of frying. These results are in close agreement with the findings of the Al-Zamily and Al-Hakim (1987) who reported an increase in specific gravity, refractive index, viscosity of some fats (bint, corn and raee) during deep fat frying of potato chips at 180 ± 5°C for 90 hours.

The results pertaining to chemical characteristics are shown in Table 2. It is evident from the results that the chemical characteristics such as acid value, saponification value, peroxide value increased with increasing time period of frying. These results are in accordance with the findings of Malolepszy (1981), Coll-Hellin and Clausell (1985). The saponification value of original sample of Canola oil was found to be 176.154. These values are greater than 123.06 for high erucic acid (*B. oleracea*) seed fat as reported by Kaul *et al.* (1980). The higher saponification values for Canola oil are due in part to lower erucic acid i.e. replacement of long chain fatty acid like erucic acids ($C_{22:2}$) by C_{18} fatty acid. These results are very close to the findings of Borowski and Ratkiavicz (1985) who reported an increased in saponification value from 198.7 to 219.9 mg KOH/g after heating and frying of soybean oil at different temperature (163°C - 180°C) at times (25 - 540 min).

An iodine value of 61.2 was reported by Kaul *et al.* (1980)

Table 1: Changes in physical characteristics of the oil sample (Canola oil) during frying at different time intervals

Physical	Time Intervals (Hours)								
	O.S.	C.U.T	1	2	3	3½	4	4½	5
Specific gravity	0.912	0.9129	0.913	0.9158	0.919	0.9193	0.9205	0.9215	0.925
Refractive index	1.671	1.672	1.673	1.674	1.675	1.675	1.674	1.677	1.678
Viscosity (Centipoise)	5.21	5.92	6.77	6.97	7.62	7.82	7.90	8.52	10.58

C.U.T. = Come up temperature time = (11.9 minutes)

Table 2: Changes in chemical characteristics of oil samples (Canola oil) during frying at different time intervals

Chemical Parameters	Time Intervals (Hours)								
	O.S.	C.U.T	1	2	3	3½	4	4½	5
Acid value	2.13	2.24	2.80	3.08	3.20	3.22	3.47	3.76	4.61
Saponifica-ation value	176.154	179.52	182.32	187.93	190.74	193.54	196.54	199.15	201.95
Iodine value	105.5	103.14	100.06	97.53	92.72	90.17	86.37	82.58	80.03
Peroxide value	7.1	9.8	13.7	16.25	18.7	19.1	19.6	21.8	23.4

C.U.T. = Come up temperature time = (11.9 minutes)

for high erucic acid (*B. oleracea*) seed fat as compared to 105.5. These higher values of Canola oil are due in part to a replacement of erucic acid with oleic acid together with smaller increase in linoleic acid ($C_{18:2}$) and linolenic acids. The development of higher linoleic acid ($C_{18:2}$) oil would be expected to reduce the iodine value due to decrease in linolenic acid ($C_{18:3}$) as reported by Vaisey *et al.* (1982). The peroxide value was found to be 7.1. These values are in close agreement with peroxide values of 10 far low erucic acid rapeseed oils as reported by Vaisey *et al.* (1982). These results are in close agreement with the findings of Tehmina(1996) and Saadia (1997).

The above results indicated that frying of all samples of Canola oil produced significant physical and chemical changes which cross the border of safety and toxicity surely. Such type of toxicity is reported by Chang *et al.* (1978) so we should avoid extensive heating and indiscriminate frying as much as possible if we want to secure our health.

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