

Changes in the Peroxide Value of Different Media as Affected By Subsequent Fryings of Chips

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ABSTRACT Different frying media were used for studying the effect of repeated and subsequent deep fryings of potato chips on the corresponding peroxide values. It was observed that with the increase in the number of intermittent frying in the same media without any replenishment of oil, the peroxide value increased, which is an index of oxidative rancidity.

INTRODUCTION

Oils and fats are used as a medium for cooking in sauteeing, shallow and deep frying. Among these methods, frying in the suitable media as deep fat frying is a well accepted practice. Many foods are deep fried to preserve them for a longer time. Such a method does not significantly change to quality and palatability of the food fried therein. But when the same oil is used time and again for the subsequent fryings, deteriorative changes take place which can have toxic effect on human health. There is some evidence that highly oxidised oil does have carcinogenic properties (Peacock and Beck, 1951).

MATERIAL AND METHODS

Four different oils rape seed, mustard, cottonseed, and groundnut and vegetable ghee were used for the frying of the chips of uniform size and thickness (Var, *Kufri Jyoti*). All efforts were made to keep the temperature and other variables constant. Regular frying was made in the same media for a period of six weeks at weekly interval. The oil sam-

ples (1/2 kg) replicated thrice were collected after each frying for analysis. Peroxide value was determined by the method suggested by Snell and Biffen (1972). The statistical analysis was done according to the method of Snedecor and Cochran (1982).

RESULTS AND DISCUSSION

It was observed that the preoxide value of the frying media increased gradually with the increased number of fryings and the storage period. Lower peroxide values were observed in shortening (hydrogenated vegetable ghee) as 8.40 and higher in the case of mustard oil as 14.04 with rest of the media having intermediate values.

On comparing the changes in the peroxide value of the same oil in different fryings, it was found that the values in all oils in subsequent frying were significantly different which progressively increased (Table 1). Mustard oil, cottonseed oil, and ghee showed significant difference after each subsequent frying, except between the second and third frying when the difference was insignificant. Similar trend was also observed between fourth and fifth frying. But the peroxide value of mustard oil increased above the limit of indicative quality index (IQI = 10) after the second frying whereas cottonseed oil after the fourth and ghee after sixth frying.

The increased peroxide value could be termed as the quality indicator for the onset of rancidity but in the present case no association was found between the development of rancid flavour with the increased peroxide value of media in the organoleptic evalua-

Table 1 : Changes in mean peroxide values (m.eq./kg fat) of oils on subsequent fryings of potato chips

S. No.	Name of frying media	Time (weeks)						Oil's mean
		1	2	3	4	5	6	
1.	Rapeseed oil	4.86	9.73	11.46	11.46	16.00	20.89	12.40
2.	Mustard oil	8.86	11.46	13.00	15.30	16.66	19.00	14.04
3.	Cottonseed oil	7.07	9.73	10.86	12.93	15.93	17.33	12.31
4.	Groundnut oil	8.00	9.27	14.00	14.47	15.33	17.93	13.16
5.	Ghee (Shortening)	3.73	8.00	8.00	9.47	10.87	12.60	8.40
	Week's Mean	6.50	9.19	11.46	12.72	14.96	17.55	—

1. CD at 5% level for the difference of two oil's mean at the same time/week or for the difference of two week's means for the same oil = 1.57
2. CD at 5% level for the difference of two oil's means = 0.64
3. CD at 5% level for the difference of two week's means = 0.70

tion. However, oils exposed to air during subsequent intermittent fryings indicated an evidence of deterioration. The deteriorative changes were lipolytic, oxidative and polymeric resulting in the modification of the physical properties of the oils. The rancidity could have been due to the hydrolysis of fatty acids esterified to the glycerol molecule. Such hydrolytic rancidity may have been catalysed in chips by processing at high temperatures. The formation of fatty acids and glycerols were responsible for bad flavour. However, the oxidative rancidity which involved attack of oxygen on double bonds of unsaturated fatty acids to form peroxides as primary oxidative products like allylic hydroperoxides as classified by Dulong and Burg (1963) was as mono-and-dialkyl-peroxides.

Under normal operating conditions no oxidation or degradation was expected to take place. However, much less favourable conditions existed during commercial frying operations. High temperatures resulted in accelerating the auto-oxidation process. In addition, several other changes took place in frying media e.g. free fatty acids were formed. Iodine value was decreased considerably and

the colour was also darkened. Polymer formation resulted in the increased viscosity which in turn increased the foaming of the frying fat, making further frying difficult.

Some foods can absorb quite a bit of fat in the process of frying. If the oil is replenished, it automatically limits the deterioration of the frying media. However, since the deep frying involved intermittent cooking and there was no replenishment of oil in contrast to the shallow and continuous frying, the peroxide value increased and exhibited oxidative and hydrolytic rancidity as well as some degree of polymerisation.

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