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Assessment of Oil Quality in Some Fast Food

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Abstract: The physicochemical properties of the oil content of indomie noddles, cabin biscuit, cheese balls and doughnut were analysed to assess the quality of oil content. The food samples were purchased from grocery stores in Gwagwalada area council of Abuja. The physicochemical properties of the extracted oils like acid value, peroxide value, pH and colour were determined and compared to edible oil physicochemical properties to assess the quality of the oils.

Key words: Acid value, Peroxide value, physicochemical properties, oil content, food samples

Introduction

The fast-food sector uses frying widely². Food frying has long been used as a technique to prepare various foods both at home and in industrial food sectors. Since fried foods develop a much desired texture, flavor and appearance, they are consumed in large quantities all over the world³. Vegetable oil quality and stability are the main factors that influence its acceptability and market value. Oxidative stability is one of the most important indicators of the keeping quality of vegetable oils⁴. In frying, the frying oil serves as a heat transfer medium and an ingredient of fried food. During this process, heat transfer from oil to food and cooking of food, meantime water vaporization from food into the oil and then to the atmosphere, penetration of oil into the capillaries formed in food, air-oil mixing at the surface and similar phenomena occurred constantly.

The heat reduces moisture content of food surface nearly to 3%,³ and oil enters into the spaces left by the evaporating water. A series of physical and chemical changes take place in frying oils used at around 175 °C or above³. The factors that affect the oil and product quality during deep-fat frying are refreshing ratio of oil, frying time and temperature, heating type, composition of frying oil quality of start up oil, composition of fried food, fryer type, antioxidants and oxygen availability. During frying, some chemical reactions like oil hydrolysis, thermo-oxidation, dimer and polymer formation, Maillard reactions and others take place in the oil. The products of these reactions accumulate by time and lead to deteriorate oil and to reduce the frying oil quality and healthiness properties of fried foods^{7,8}. From a nutritional point of view, it should be taken into account that oils with high amounts of saturated fatty acids and fats containing trans fatty acids are less desirable for good health¹⁰. Moreover, highly saturated fatty acid composition of some industrial frying oils may represent a problem in case it is necessary to keep the product in the liquid state³.

Experimental Section

Materials and Method

The indomie noddles, cabin biscuits, cheese balls and doughnuts were purchased from grocery stores in Gwagwalada area council of Abuja, Nigeria. The oil from the indomie noddles, biscuits, cheese balls, and doughnut were extracted using Soxhlet extraction apparatus. The oil extracted was dried and then filtered. The physicochemical properties of the oils were determined and compared to the standard index for edible oil.

Property Determination

The physicochemical properties of the oils extracted were determined by volumetric analysis using the IPAN (Institute of Public Analyst of Nigeria) analytical procedure. The kinematic viscosity was determined with the Canon Ubbelohde glass tube Viscometer (standard test ASTM D445 and ISO 3104)

Results and Discussion

Table.1 Results of the Physicochemical Properties of Oil

S.no	Oil	Acid value (mgKOH/g _{oil})	Peroxide value (mEq/kg)	Oil content (%)	pH	color
1	Oil from indomie	2.61	2.2	17.83	5.41	yellow
2	Oil from biscuit	6.84	6	5.73	3.62	Light yellow
3	Oil from cheese balls	3.76	16	16	3.47	white
4	doughnut	2.61	3.8	12.8	5.27	yellow

Table 2 Recommended Codex Standards for Edible Oils

Oil	Relative Density 20°C/water at 20°C	Refractive index at 40°C	Saponification value(mg KOH/g _{oil})	Iodine Value (wijs)	Unsaponifiable matter (g/kg) max	Acid value (mgKOH/g) max	Peroxide Value (mEq/kg) max
Babassu	0.914-0.917 (25°C/20°C)	1.448-1.451	245-256	10-18	12	0.6	10
Coconut	0.908-0.921 (40°C/20°C)	1.448-1.450	189-265	6-11	15	VO, 4 NVO 0.6	10
Cottonseed	0.918-0.921	1.448-1.466	189-198	99-119	15	0.6	10
Grapeseed	0.923-0.926	1.473-1.477	188.194	130-138	20	0.6	10
Groundnut oil	0.914-0.917	1.460-1.465	187-196	80-106	10	VO, 4 NVO 0.6	10
Maize	0.917-0.925	1.465-1.468	187-195	103-128	28	VO, 4 NVO 0.6	10
Mustard seed	0.910-0.921	1.461-1.469	170-184	92-125	15	VO, 4 NVO 0.6	10
Olive (virgin)	0.910-0.916	1.4677-1.4705	174-196	75-94	15	6.6	20
Olive Refined)	0.910-0.916	1.4677-1.4705	174-196	75-94	15	0.6	10
Olive pontace (Refined)	0.910-0.916	1.468-1.4707	182-193	75-92	30	0.6	10
Palm oil	0.891-0.923 (40°C/20°C)	1.449-1.455 (50°C)	190-209	50-55	12	VO, 10 NVO 0.6	10
Palm kernel	0.899-0.914	1.488-1.452	230-254	13-23	10	NVO, 0.6	10
Rape	0.910-0.920	1.465-1.469	168-187	94-120	20	VO, 4 NVO 0.6	10
Rape (LEAR)	0.914-0.920	1.465-1.470	182-193	110-126	20	0.6	10
Safflower	0.922-0.927	1.467-1.470	186-198	135-150	15	0.6	10
Sesame	0.915-0.925	1.465-1.469	187-197	104-120	20	VO, 4 NVO 0.6	10
Soya	0.919-0.925	1.466-1.470	189-195	120-143	15	0.6	10
Sunflower	0.918-0.923	1.467-1.469	188-194	110-143	15	VO, 4 NVO 0.6	10

VO=virgin oil, NVo= non virgin oil

Oil Content

After extraction, the oil content of indomie noddles, cabin biscuit, cheese balls and doughnut were found to 17.8% , 5.73%, 16%, 12.83%w/w oil respectively.

Acid Value

The acid value of indomie noddles, cabin biscuit, cheese balls and doughnut were determined to be 2.61, 6.81, 3.61, 2.61mgKOH/g respectively using analytical procedure. The presence of fatty acid in an oil or fat is an indication of previous lipase activity, other action or oxidation. The acid value therefore is a measure of the extent to which the glycerides in the oil or fat have been decomposed by lipase activity or action. The maximum fatty acid limit is considered to be 2.5% (European Union)¹.

Peroxide Value

The peroxide value of indomie noddles, cabin biscuit, cheese balls and doughnut were determined to be 2.2, 6, 16, 3.8mEq/kg respectively using analytical procedure. Oxidation of unsaturation oil or fat takes place via formation of hydro-peroxide (ROOH). The hydro-peroxide subsequently decompose into secondary oxidation products, the majority of which has unpleasant odours or flavours. The peroxide value of indomie noddles, cabin biscuit and doughnut are within acceptable limit but that of cheese ball is above the maximum value of 10mEq/kg⁶.

Conclusion

The assessment of oil quality from the food products analysed showed that the acid value of the oil from cabin biscuit is beyond the value recommended by the European union for fried food. This is an indication of high lipase activity or other action. It is therefore important that health checks are regularly conducted on fast foods. It is also important to assess the quality of oil for frying fast food.

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