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Analysis of Oil in Fried Food Units in Dindigul Corporation

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Abstract: Present study is to analyse the frying oil standard in fried food manufacturing units in Dindigul Corporation, Tamilnadu, INDIA with special reference to Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011. In the standards, acid value which is the relative measure of rancidity and iodine value which is the measure of unsaturation are the two key parameters under analysis.
Key words: Acid value, Iodine value, Frying oil.

I. INTRODUCTION

Food is the inseparable component of any lives that need for their survival. In the present modern era due to un-imaginary development in technology the world shrinks into a small village by which the cuisines of one can be shared by all in the world. Make it tasty and edible many methods are adopted for cooking which includes boiling, thawing, roasting, baking, frying etc. Among all, frying stands first in the place of preference because of its crispiness added to the food. That too is more likely irrespective of age group, gender of the consumers when it is added with spices. Oils are extensively used in fried food processing units as a cooking medium since it has a high boiling point and the food get fried faster. The oil covers the surface of the flour particles and prevents the sticking of particles together.

What adds taste and flavour to all cooked foods, especially the fried foods? We all know that it is the Oil to the greater extent. Oil belongs to the class of organic compounds called lipids. Basically oil in diet has come into focus due to their connection with food cholesterol and consequently heart diseases. It exhibits unique physical and chemical properties which play a vital role in their diverse functional properties. Oils undergo complex chemical changes during processing, storage and handling which lead the changes in their flavour, odour and taste of the food commonly known as Rancidity. The chemical process involved is called auto oxidation because the rate of oxidation increased as the reaction proceeds. The odour and flavour deterioration is because we taste individual fatty acids obtained from hydrolysis more than the triglycerides themselves.

Food safety is the holistic measure to be adapted from the form to plate to end with safety food. In the view to end with safe food, the frying oil should be safe. Thus the safety of the fried food mainly depends on the safety of the oil used. Hence this study of evaluating the standard of the frying oil has its key role in evaluating the safety of the fried foods indirectly.

Iodine value (IV) and acid value (AV) is one of the oil quality parameters used to asses fats and oils, including RFO. Usually, the determination of these values was carried out using the titration method According to AOCS procedure. FTIR spectroscopy assisted by chemometrics of multivariate calibration in the analysis of data has been successfully used for the determination of quality parameters of fats and oils namely for determination of iodine number in palm oil [1], vegetable oils [2], coconut oil [3] and in the pure triglycerides [4]. FTIR spectroscopy has also been successful for determining the acid number in lubricant [5], free fatty acids in palm oil [6], acid value in vegetable oil [7], fish oil [8] and in olive oil [9].

Available methods for determination of acid value and iodine value, including automatic photometric titration [10], flow injection analysis [11, 12], and potentiometric titration [13]. Various instrumental methods have also been used to determine the AVs of edible oils, including gas chromatography [14], high-performance liquid chromatography [15], capillary electrophoresis [16], electrochemical impedance spectroscopy [17], ultraviolet–visible spectroscopy [18], Raman spectroscopy [19], 1 H NMR [20], infrared spectroscopy[21,22] and near-infrared spectroscopy [23].

Present research is analysing the standard of the frying oil with reference to Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 which is the mandatory compliance to the food products developed by the Food Safety and Standards Authority of India

II. METHODOLOGY

A. Sample Collection

Frying oil samples are collected by Random Sampling Method. The oil ready to use for frying is collected in various part of Dindigul Corportation. Totaly 18 Nos of samples are collected and fixed the study population as 18.

B. Analysis Section

The analysis procedure as laid down in the Manual of methods of Analysis of Foods – Oils and Fats (DGHS, Ministry of Health and Family Welfare, GOI,2005) is adopted for the analysis.

1) Acid value analysis: Acid value was determined by the titration method. According to this method, weighed accurately about 10 gm of the oil under test into a 250ml conical flask and added 100 ml hot EtOH. Heated the flask over a water bath for about 30 minutes. Cooled it and the contents to room temperature and added few drops of phenolphthalein indicator. Titrated against the standard N/10 KOH solution. The appearance of faint permanent pink colour is the end point.

C. Calculation

$$\text{Acid Value} = \frac{56.1 * V * N}{W}$$

In which V = Volume of KO H consumed
N = Normality of K OH
W = Weight of the sample.

1) Iodine Value Analysis : In Wijs method 0 .2 gm of sample is take n in the Iodine flask for the analysis to that added 25 ml o f Carbon tetra chloride and 25 ml of standard (0.2N) wijs solution (10 ml of Iodine mono chloride in 1800 ml of glacial acetic acid). Bef ore that Wijs solution is standardised by titrating against standard Sodium thio sulphate using starch as indicator. The content is kept undisturbed in th e dark for 30 minutes. After added 100 ml hot water followed by the addition of 15 ml of 10 % KI. Titrated against standard (0.1 N) Sodium thio sulphate using starch as indicator. Blank titration was conducted without the sample. T he volume is the differ ence between the blank titre value and the sample titre value.

D. Alculation

$$\text{Iodine value} = \frac{12.69 * V * N}{S.W}$$

In which V = Difference in volume consumed between Blank and the sample
N = Normality of STS
S.W= Weight of the sample taken.

III. RESULTS AND DISCUSSION

Out of 18 samples collected 16 are Refined Palm Oil and 2 are Refined Sunflower oil.

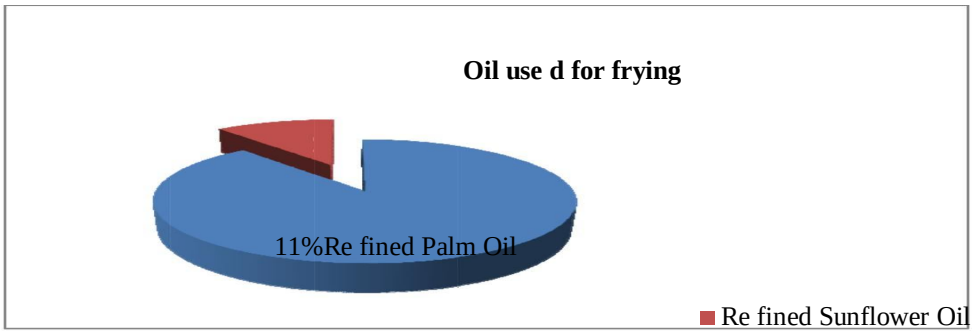

Chart -1 Represents the ratio of oil used for frying in fri ed food units.

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.Table 1. The data collected in the analysis are tabulated as follows

S.NO	Sample Nature	Sample No.	Acid Value	Iodine Value
Refined	Palm oil		NMT0.5	45-56
Refined Sunflower Oil			NMT0.5	100-145
1	Refined Palm oil	RPO-001	0.46	53.1
2	Refined Palm oil	RPO-002	1.0	57.2
3	Refined Palm Oil	RPO-015	0.7	52
4	Ref.Sunflower Oil	RSO-001	0.4	107.8
5	Ref.Sunflower Oil	RSO-002	0.42	104
6	Refined Palm Oil	RPO-008	0.48	48
7	Refined Palm Oil	RPO-003	0.9	51.2
8	Refined Palm Oil	RPO-004	2.15	44.1
9	Refined Palm Oil	RPO-005	1.08	58.1
10	Refined Palm Oil	RPO-006	1.75	51
11	Refined Palm Oil	RPO-007	1.90	53.8
12	Refined Palm Oil	RPO-008	0.41	48
13	Refined Palm Oil	RPO-009	0.6	47.4
14	Refined Palm Oil	RPO-010	0.52	46.9
15	Refined Palm Oil	RPO-011	1.1	49.2
16	Refined Palm Oil	RPO-012	0.68	52.1
17	Refined Palm Oil	RPO-013	0.9	55
18	Refined Palm Oil	RPO-014	0.61	55.1

Out of 16 Refined palm oil 13 are substandard when comparing with the standard acid value for Refined palm oil as in the Food Safety and Standards (FPS&FA) Regulations,2011. 3 are standard.

IV. REFINED PALM OIL

Rancid oil forms harmful free radicals in the bod y, which are known to cause cellular damage and have been associated with diabetes, Alzheimer's disease and other conditions. Rancid oils can also cause digestive distress and deplete the body o f vitamins B and E. In his book "8 Weeks to Optimum Health", Dr. An drew Weil says rancid oil can also cause damage to DNA, accelerate aging, promote tissue degeneration and foster cancer development. While rancid oil may taste bad, it doesn't normally make you sick, at least not in the short term. Rancid o il does contain free radicals that might increase your risk of developing diseases such as cancer or he art disease down the road. Rancid o ils may produce damaging chemicals
and substances that may not make you immediately ill, but can cause harm over time. Chemicals such as peroxides and aldehydes can damage c ells and contribute to
atherosclerosis. Free radicals produced by rancid oil can also damage DNA in cells. Produce d by toxins as well as by normal bodily processes, free radicals can ca use damage to arteries as well act as carcinogens, substances that can cause cancer. If

oxidative rancidity is present in severe quantities, a potential health hazard may exist. High levels of malonaldehyde are found in rancid foo ds. Malonaldehyde is a decomposition product of polyunsaturated fatty acids. Th is chemical has been re ported to b e carcinogen ic and a potential health hazard do es exist. Eating rancid o il will expose you to accelerated aging, raised cholesterol levels, obesity and weight gain. Daily consumption increases the ris k of degenerating diseases such as cancer; d iabetes; Al zheimer's disease; and a therosclerosis, a condition in which artery walls thicken due to a buildup of fatty materials. Among the 13, in 10 the acid value are higher that is why it becomes substandard.

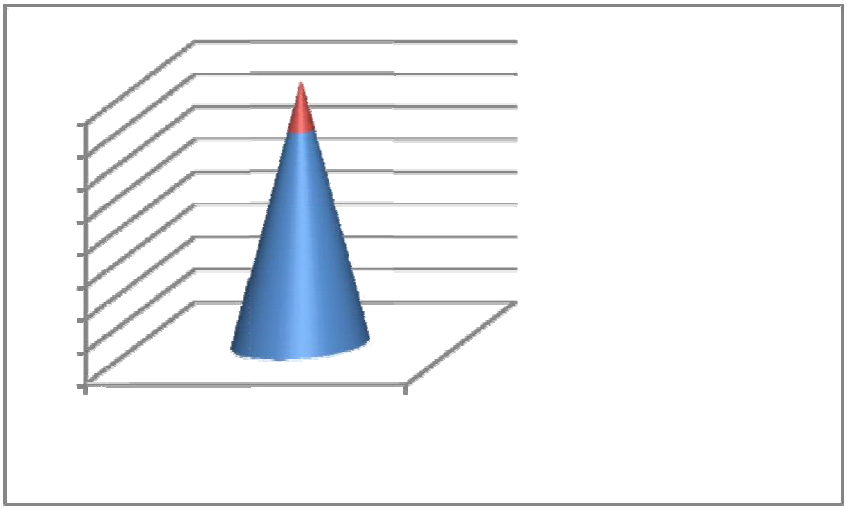
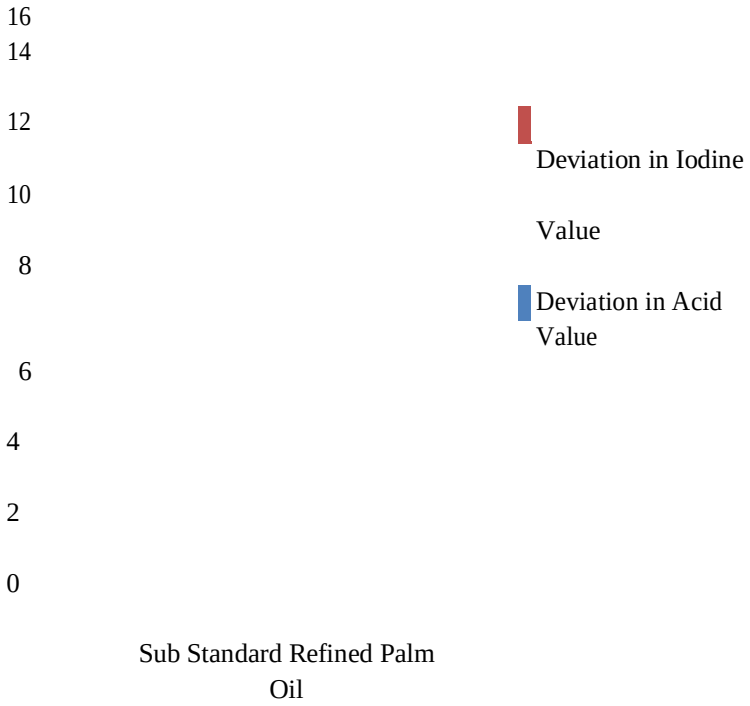


Chart -2 Represents the Deviat ion in Acid Value and Iodine Val ue in Refine d Palm Oil



A mong the 16 samples 3 are substandard due t o the low Iodine value and makes t he oil substandard. Similar to ac id value an other factor which has very important health implications, is Iodine value. All oils are composed of fat molecules known as fatty aci ds which are classified as saturated, mono-saturated and unsaturated fatty acids. The terms w e refer the degree of hydrogen saturation. Iodine value is a measure of the amount of unsaturated fatty acids in oil. It is of value to us because it gives an indication of the oil's stability and health properties. The higher the iodine value the less stable the oil and the more vulnerable it is to oxidation and free radical production. High Iodine value oil s are prone to oxidation and polymerisation. During heating, such as w hen used in cooking, oils with a high Iodine value readily oxidize and polymerize. The higher the temperature and longer t he

exposure to heat, the grater the degree of polymerization. These products of oxidation have been shown to be associated with numerous health problems , including cancer an d atherosclerosis (Hardening of the arteries).

The analytical value of both Acid value and Iodine value o f Refined Sunflower oils (2No) show that they are within the prescribed limit and hence decided as Standard.

V. CONCLUSION

N early 89% of fried food units are using Refined palm oil as a frying medium an d 11% are using Refined Sunflower oil as a frying mediu m. In the units using Refined palm o il around 81.25% are substandard. The percentage of sub standard du e to deviation in both acid value an d Iodine value is 18.75% . The percentage of sub standard due to the deviation in acid value al one is 89%. That implecats that t he acid value which is the indirect measure of rancidity is the main factor which lowers the standard of oil. Hence the rancidity, t he degradation of triglycerides to acid is the major factor t hat affects th e quality an d standard of the oil.

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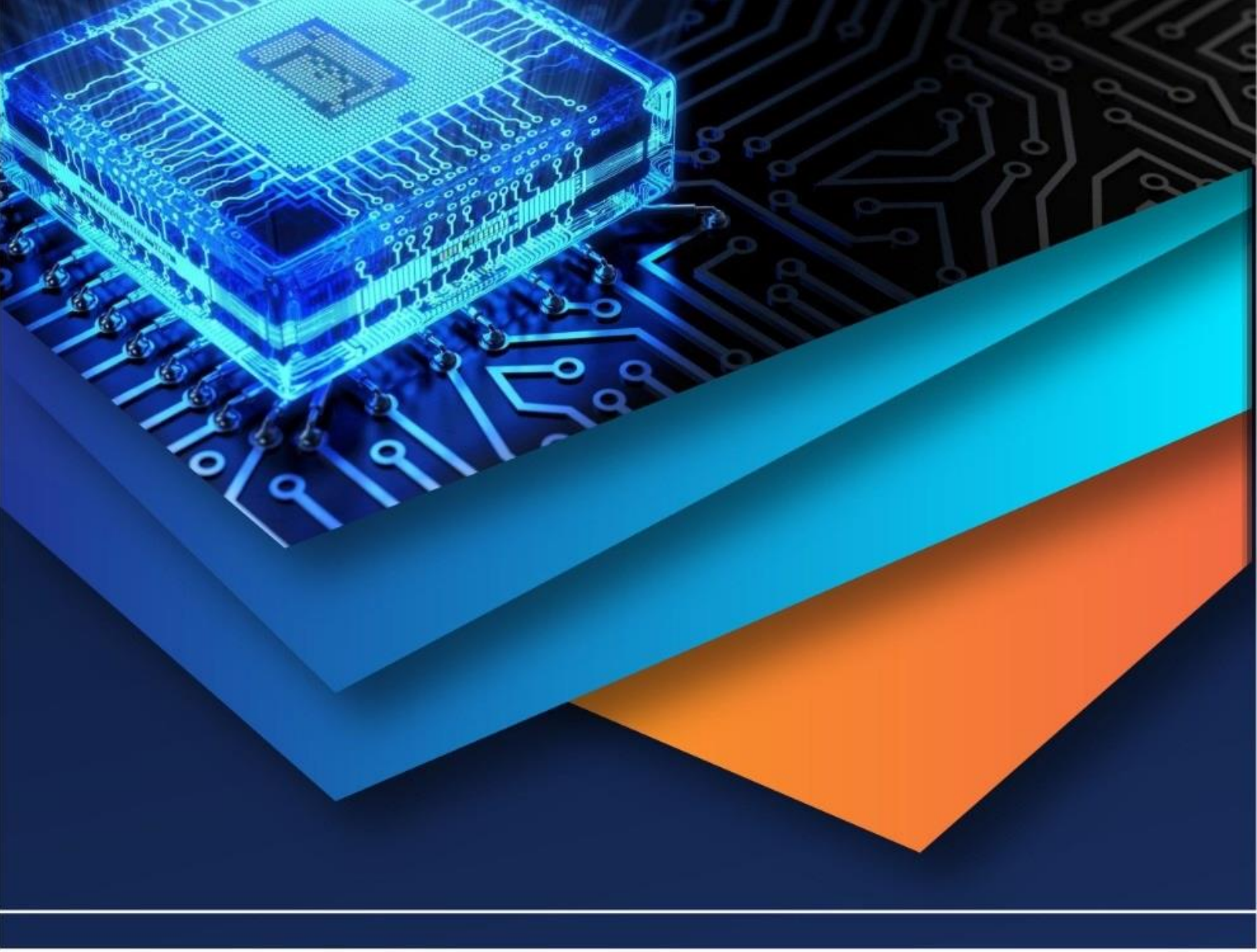

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