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Quality control analysis of edible oil samples in selected habitats of Urban Krishna district

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ABSTRACT

Lipids are heterogeneous compounds that are potential related to fatty acids. Fats and oils [6-8] are the simple lipids and are defined as glycerol esters of fatty acids (edible and nonedible) play a significant role in every human being's life. The present review is to analyze essential parameters of the fatty acids present in the edible oils [6-8] in term of the determination of the Acid value, Saponification Value and the Iodine Value of the samples. These oils [6-8] have been collected from different hygienic and unhygienic environments of Vijayawada in Krishna district for checking their quality in terms of Rancidity, Degree of unsaturation and Average chain length of the Fatty acids.

Key words: Titrimetry, Determination, Analysis, Acid Number, Saponification Number, Iodine Number,

INTRODUCTION

Lipids[1-5] are bimolecules, composed of carbon and hydrogen that are essential for cell growth. Saturated fats come from animal sources such as milk, butter and the unsaturated fats are of vegetable origin. Lipids can be classified into three subgroups based on chemical composition: hydrocarbons with only C and H, simple lipids contain C, H, along with O and complex lipids contain C, H, O, and one or more additional elements, like nitrogen, or Sulfur. The various parameters employed in determining the quality of the oils [6-8] are the acid value, the Saponification value, the iodine value, the alkali value, the Polenske value and the R.M value. The acid number is a sum parameter for all acidic components also it is a measure for the long-term stability and corrosiveness of the Oil [6-8]. Saponification value Investigates the average chain length of the fatty acid Iodine value is a measure of the degree of unsaturation of fatty acids in fats and oils [6-8] as double bonds. The Polenske value is an indicator of how much insoluble and volatile fatty acid can be extracted from fat through saponification. The RM value is an indicator of how much soluble fatty acid can be extracted from fat through saponification.

MATERIAL

Oil samples, 0.1N KOH (solution, 0.5N KOH solution, 0.5 N HCl, Hanus Reagent (2.669gm Iodine /200ml Glacial Acetic Acid), KI solution (20gm KI/200ml water), Hypo Solution (12.5gm hypo/500ml water), Starch solution (1gm/100ml), Chloroform, phenolphthalein indicator. Burettes (Borosilicate), Pipettes (1ml, 5ml), Conical flasks (250 ml), Iodine Flasks (200ml),Electronic Balance (maximum limit 300mg), Aluminum Foil paper.

METHODS

ACID Number[9, 10]

The acid number is a sum parameter for all acidic components also it is a measure for the long-term stability and corrosiveness of the Oil[6-8]. To 1gm of the oil sample taken in a 100ml volume conical flask a solvating agent Chloroform (5ml) and phenolphthalein (1ml) indicator are added and titrated against KOH (0.1 N) taken in a borosilicate burette and the volume of the KOH rundown is where the faint pink color of the solution persists for 20-30 seconds. A blank experiment was performed using water instead of oil. Acid number was calculated using the equation

$$\text{Acid Value} = [5.6\ (X)]/10$$

Saponification Number[11, 12]

Saponification value represents the number of milligrams of potassium hydroxide required to saponify 1g of fat also it is a measure of the average fatty acid chain length.

Into a glass stoppered conical flask 1gm of the oil sample was taken and a solvating agent (Chloroform, 3ml) and KOH (25ml, 0.5N) solution are added. The flask is covered with a piece of Aluminum foil paper and then kept in a boiling water bath for 30 minutes. After removed from the water bath flasks are cooled and 1ml of phenolphthalein indicator Is added to it the colour of the solution changes to pink and then this solution is titrated against HCl (0.5N) taken in a borosilicate burette and the rundown volume is noted. Blank is performed with water instead of oil sample. Saponification number is calculated using the equation;

$$\text{Saponification Value} = [\text{Vol. of HCl rundown for 1 gm of oil sample}] / 56$$

Iodine Number[13]

Iodine value is a measure of the saturation of fatty acids in fats and oils [6-8] as double bonds. To 10gm of the oil sample taken in a 200ml conical flask, a solvating agent (Chloroform 5ml) and the Hanus reagent (25ml) is added, the flask is closed with the glass lid provided and then placed in a dark condition for 1hour. After 1hour, sidewalls of the flask are rinsed with distilled water (50ml) and then of KI (10ml) solution is added and is titrated against Hypo solution loaded in the borosilicate burette. When the colour of the solution changes to pale yellow, of starch (10ml) is added due to which the colour changes to dark blue, again the titration is continued till the colour of the solution changes to colourless. At the end point where the colour changes to colourless, the volume of hypo rundown is noted.

The Iodine number is calculated using the following equation

$$\text{Iodine Number} = \frac{[\text{Volume of hypo for blank}] - [\text{Volume of hypo for titration}]}{[\text{Volume of hypo for blank}]} \times 6.35$$

The three parameters Acid Value, Saponification value and the Iodine value for the three different oil samples Palm oil, Groundnut oil and the Sunflower oil collected from 5 different outlets are determined using the above mentioned procedures.

RESULTS

The results of analysis are tabulated case wise in the form of samples obtained from household (Table 1), samples obtained from Retail outlets (Table 2) , samples obtained from unhygienic low class localities (Table 3) , samples obtained from Direct and exclusive oil suppliers (Table 4) and samples obtained from Street vendors (Table 5).

Table 1: Oil samples from Household

Expt/Oil sample	Blank	Palm oil	Groundnut oil	Sunflower oil
Acid Value	-	6.16	5.04	2.68
Saponification Value	28	11.2	11.2	5.6
Iodine Value	0	78.105	79.375	98.425

Table 2: Oil samples from retail outlet

Expt/Oil sample	Blank	Palm oil	Groundnut oil	Sunflower oil
Acid Value	1.008	0.896	0.728	0.616
Saponification Value	33.6	22.4	39.2	28
Iodine Value	0	50.165	55.88	60.325

Table 3: Oil samples from low class localities

Expt/Oil sample	Blank	Palm oil	Groundnut oil	Sunflower oil
Acid Value	0.56	0.728	0.896	1.008
Saponification Value	33.6	22.4	39.2	44.8
Iodine Value	0	38.1	40.005	41.91

Table 4: Oil samples collected from Manufacturers

Expt/Oil sample	Blank	Palm oil	Groundnut oil	Sunflower oil
Acid Value	-	16.352	12.712	11.424
Saponification Value	28	16.8	22.4	5.6
Iodine Value	0	44.45	41.91	56.575

Table 5: Oil samples collected from Street Vendors

Expt	Oil sample
Acid Value	16.128
Saponification Value	11.2
Iodine Value	40.005

DISCUSSION

Oil samples collected from various sources exhibit marked variation in their determined values of Acid Number, Saponification Number and iodine number. There is a huge variation in acid number values that is a measure of rancidity in samples collected from household to those samples collected from street vendors, the present day generation is fond of junk food and prefer eating substances available with street vendors where the oil is reused again and again. Oil samples from various habitats also showed a variation between saponification number and iodine number of the oil samples. The variation was remarkable between samples obtained from low class localities and household samples. Similarly the iodine value of oil samples obtained from different habitats showed a great variation between household, where the number was reasonably very high, indicating higher degree of unsaturation, compared to iodine number of oil samples from low class localities which showed a low iodine number, indicating higher levels of adulteration in these samples.

CONCLUSION

Oils [6-8] play a significant role in everyday life of any individual, as they are responsible for the formation of various important products such as cholesterol, acetyl CoA and other compounds of biological significance, when they are degraded by pancreatic lipases in the gastro intestinal tract. The present study taken for creating general awareness presents a clear picture that individuals who are from low class localities and those taking food from street vendors are more prone to suffer for cardiac and related disorders as the oils [6-8] samples thay

are consuming contains very high acid number indicating very high levels of rancidity, and low iodine number indicating higher degree of saturated fatty acids, indicating high risk of heart disease.

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