



**CHEMICAL CONSTANTS OF SOME EDIBLE OILS
WITHIN THE STATE OF ANDHRA PRADESH**

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ABSTRACT

The commercially available oil samples are analyzed for their Iodine, Saponification, Peroxide and Acid values. These values are subjected to statistical analysis by comparing with each other. The least Iodine value was identified for Coconut oil. Lower peroxide values were observed in the oils from Groundnut, Olive, Coconut and Rice bran. Sunflower oil exhibited the highest saponification value. Rice bran and Palm oil has the lowest Acid values. These properties help the chemist to opt for the suitable oil for household purposes and other requirements.

KEYWORDS:Oils, Saponification, Iodine value, Peroxide value, Acid value.



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INTRODUCTION

India is the largest economy in importing major vegetable oils^{1,2}. It occupies 3rd largest place among major vegetable oil consuming countries of the world^{1,2}. The major oil seed growing states are Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Andhra Pradesh. It is essential to investigate the oil quality parameters thoroughly because of their economic importance³. The analysis of oils requires collection of characteristic data of different types of oils. Such determination can be accomplished by the fat constants like Iodine, Peroxide, Saponification and Acid values. Oils are generally used for food and in the manufacture of paints, varnishes, soaps, detergents, bio-lubricants, bio-diesel and many other industrial products⁴. For this purpose, an investigation is done to determine the chemical constants which may help the chemist to check for purity or possible adulteration, qualitative analysis of certain properties, identification of biological values and natural characteristics of fat. Previous research methodologies have been adopted for carrying out the experiments on the edible oils used in the state of Andhra Pradesh in southern part of India. The aim of the analysis is to find the preferable edible oil by examining the values obtained. The findings may serve as a guide for the society to use safer and healthier oils available in the market.

MATERIALS AND METHODS

The samples from purified and packaged oils in distribution by several companies were taken for analysis. These oil samples were subjected to standard methods for the determination of scientific values of edible oils extracted from Palm, Sunflower, Groundnut, Rice bran, Coconut and Olive.

(i) Determination of Iodine value⁵

In 50ml of Chloroform, 0.5g of the oil sample was dissolved, which is taken in a 500ml conical flask. To this 15ml of Hanus solution was added into each flask and corked⁶. This mixture is allowed to stand for 30 minutes in darkness. Simultaneously, using the similar solutions a blank test is implemented. At the

end of reaction 10ml of 10% Potassium Iodide and 10ml of distilled water are added to each flask with vigorous shaking. Finally the solution is titrated against 0.1N Sodium thiosulfate. After the observation of straw yellow color 2ml of starch indicator is added. The end point of titration is met when the solution entirely loses blue color. Now, the Iodine value is calculated from the expression: $1.26 (a-b) / w$, where 'w' is the weight of the sample, 'a' is the volume of 0.1N Na₂S₂O₃ for the blank and 'b' is the volume of 0.1N Na₂S₂O₃ for the sample.

(ii) Determination of Peroxide value⁷

The standard method prescribed by the Association of Official Analytical Chemists was performed to measure the peroxide value⁸. In this procedure, the oil samples weighing 2g were taken individually in different conical flasks and then a solution of Acetic acid and Chloroform in the ratio 3:2 is added. Later, the solution of saturated Potassium Iodide of 0.5ml is mixed up with samples in every flask. All the flasks are then undisturbed for 5 minutes. Now the distilled water measuring 15ml is added to each flask and then titrated with a Sodium thiosulfate solution of 0.1N until the yellowish color disappears. Finally, 0.5ml of starch is added and the titration is continued till the end point where the mixture turns colorless. The peroxide values are calculated from the expression: $1000 (V_2 - V_1) T / m$, where 'V₁' is the volume of 0.1N blank, 'V₂' is the volume of 0.1N Na₂S₂O₃, 'T' is the Normality of Na₂S₂O₃ (0.1N) and 'm' is the mass of oil taken.

(iii) Determination of Saponification value⁹

In this method, 2g of oil samples were taken in each conical flask and then mixed with ethanolic potash of 25ml. At the same time another blank test is conducted in another conical flask without the oil sample. Every flask is then boiled for 30 minutes in water with regular shaking. Then it is mixed up with 2 drops of Phenolphthalein indicator and titrated with Hydrochloric acid of 0.5M. On gentle shaking, the end point is obtained. By using the titration values, the saponification values of oils are determined by the equation

given below. Saponification value = $(V_2 - V_1) \times$ Normality of ethanolic potash \times Equivalent weight of the ethanolic potash / weight of the sample, where 'V₁' is the volume of Hydrochloric acid required for sample and 'V₂' is the volume of Hydrochloric acid required for blank.

(iv) Determination of Acid value¹⁰

Oil samples weighing 2g each were individually taken in conical flasks and each mixed up with 25ml of Carbon tetrachloride. 2 drops of Phenolphthalein indicator are added. At the same time a blank test is also

performed. The titration is done with alcoholic potash of 0.1N until the endpoint is obtained. The following expression is used to calculate the acid value: $(V_2 - V_1) \times 0.1 \times 56.1 / w$, where 'V₁' is the volume of alcoholic potash for blank, 'V₂' is the volume of alcoholic potash for sample and 'w' is the weight of the sample.

RESULTS

The chemical parameters of some oil samples determined from the experimental analysis were presented in Table 1.

Table 1
Chemical constants of some Edible Oils

| Name of the Edible Oil | Iodine Value | Peroxide Value | Saponification Value | Acid Value |
|------------------------|--------------|----------------|----------------------|------------|
| Palm | 50.928 | 25.0 | 298.790 | 1.122 |
| Sunflower | 80.136 | 15.0 | 316.366 | 5.610 |
| Groundnut | 83.908 | 5.0 | 206.938 | 2.805 |
| Rice bran | 85.940 | 10.0 | 181.855 | 1.402 |
| Olive | 83.412 | 8.0 | 188.126 | 1.507 |
| Coconut | 9.010 | 9.0 | 260.321 | 2.302 |

DISCUSSION

The Iodine value is a measure of the amount of unsaturated fatty acids in the oil. It indicates the oil's stability and health properties. Higher the Iodine value means greater the amount of unsaturation and less stable¹¹. The oil is more vulnerable to oxidation and production of free radicals. The Iodine values of the taken oil samples were within the range of standards. The Peroxide value measures the degree of oxidation of the oil. Therefore, low Peroxide values represent a decrease in the rate of oxidation. Basing on the calculated values it is observed that the Olive oil has the least value. Saponification values were inversely related to the average molecular weight of fatty acids in the oil fractions³. Our work reveals that Sunflower oil and Palm oil possessed very low

molecular weight fatty acids. Acid value is the number of milligrams of KOH required to neutralize 1g of fatty acid in the oil. It indicates the quality of oil, i.e. the rancidity of the oil¹². It is found that Palm oil, Rice bran oil and Olive oil were showing least Acid value.

CONCLUSION

From this analysis of oils it is concluded that all the chemical parameters are almost within the range which may be due to our choice of samples from the standard companies. Based on the entire study it is shown that Sunflower oil, Rice bran oil and Olive oil are the most preferable edible oils.

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