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RESEARCH ARTICLE

A Statistical Investigation & Comparative Study on Some Physicochemical Properties of Marketed Edible Oils

D. Gopala Krishna*, Fatma Nasser Al-Kharousi, Ruqaya Sulieman Al-Bahri

Department of Applied Sciences, Section-Chemistry, Higher College of Technology, Muscat-Post box no 74, PIN-133, Sultanate of Oman.

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ABSTRACT

Edible oils are an important ingredient of our daily diet. In addition to acting as a source of essential fatty acids, oils serve as a medium for the absorption of fat soluble vitamins. But the quality of dietary oil available in the market is yet to be proved. There is not an effective method to maintain the quality. In this study, an attempt has been made to analyze the quality of some commonly available edible oils in the market by analyzing their chemical parameters.

KEYWORDS

Iodine Value, Acid Value, Saponification Value, Peroxide Value, and Edible Oil

INTRODUCTION

Fat and oils are nutritionally important because they form a major group in the biological macromolecules and also one of the three major classes of food. Oils are used in a variety of ways. They are used for food texturing, baking, and frying and also used industrially, in the manufacture of soap, detergent, cosmetics and oil paints. There are numerous vegetable and edible oils derived from various sources. These include the popular vegetable oils such as soybean, cottonseed, peanuts and sunflower oils; and others such as palm oil, palm kernel oil, coconut oil, castor oil, rapeseed oil and others. They also include the less commonly known oils such as rice bran oil, tiger nut oil and numerous others. Different applications of oils mainly depend on their composition, yield and physicochemical properties.

***Address for Correspondence:**
Dr. D. Gopala Krishna
Higher college of Technology
Muscat,
Sultanate of Oman.
E-Mail Id: doctorgk2627@gmail.com

The characteristics of oils from different sources depend mainly on their compositions and no oil from a single source can be suitable for all purposes. By the present work an attempt has been made to analyze the chemical parameters of some commonly available marketed edible oils.

Edible Oil: is plant, animal, or synthetic fat used in frying, baking, and other types of cooking. It is also used in food preparation and flavoring that doesn't involve heat, such as salad dressings and bread dips, and in this sense might be more accurately termed edible oil.

Uses

For Baking: Coconut, palm, canola and high oleic safflower and sunflower oil work best.

For Frying: Because they stand up well to the heat, avocado, peanut, palm and sesame oil is ideal for frying.

For Sauteing: Many oils are great for sautéing, including avocado, canola, coconut, grape seed,

olive, sesame and high oleic safflower and sunflower oils.

For Dipping, Dressings and Marinades: When it comes to making dressings and marinades, or finding oil that's perfect to serve alongside crusty bread for dipping, you're looking for terrific flavor. For this purpose look to flax, olive, peanut, toasted sesame or walnut oil.

Smoke Point: Each oil have their own smoke point. Heating oils beyond their smoke point — the temperature at which the oil begins to smoke, generating toxic fumes and harmful free radicals—is never a good idea. Always discard oil that's reached its smoke point, along with any food with which it had contact. Most labels on bottles of oil will give the correct temperature.

Iodine Value (IV): The iodine value (IV) of oil is a direct representation of the degree of unsaturation of the oil and is widely used to characterize oils and fats. Iodine is used to halogenate the double bonds present in unsaturated fatty acids. It is defined as the number of grams of iodine absorbed by 100 g of fat. Typically, drying oils (high degree of unsaturation) have an IV ranging from 140 to 180 and above and non-drying oils (containing up to mono-unsaturated FAs) have an IV below 100. Official standards are available (ASTM 2003; ISO 3961:1996; AOCS Official Method, 1989).

Acid Value (AV): The acid value is a measure of the amount of free fatty acids present in the oil. It is determined as the amount (in milligrams) of potassium hydroxide (KOH) necessary to neutralize the FFAs in one gram of sample. The quantity of sample needed varies from about 0.1 to 20 g, depending on the expected acid value. There are several standards available for this technique (AOCS Official Method, 1989; ISO, 660:1996). Acid value is used as an indicator for edibility of oil and suitability for use in the paint industry. These values are within the allowable limits for edible oils (for coconut oil) (Eckey, 1954). An increased acid value is an indication of the deterioration of the oil. Normally fatty acids are linked to the glycerol molecule in oils through ester linkage. When these ester bonds are broken, fatty acids become free and results in an increased acid value. Free fatty acids are formed mainly by hydrolytic rancidity, which is due to partial hydrolysis of the triglycerol molecule due to traces of hydrolytic enzymes present in naturally occurring fats and oils.

Peroxide Value (PV): Peroxide value (PV) is a measure of the concentration of peroxides and hydro peroxides formed in the initial stages of lipid oxidation. PV is one of the most widely used tests for the measurement of oxidative rancidity and or deterioration of oils and fats.

Saponification Value (SV): It is defined as the number of milligrams of potassium hydroxides required to saponify one gram of fat. It is an indication of the molecular weight of the fat, and is inversely proportional to the molecular weight. Saponification value is an indication of adulteration also. The Saponification value and iodine values are characteristics of each oil.

Refine and Not Refine Oil: There is Refine or Not to Refine oil. Some oils are refined to make them more stable and suitable for high temperature cooking. Keep in mind, though, that the process removes most of the flavor, color and nutrients from the oils, too. That's why refined oils are perfect for baking and stir-frying, where their high smoke point and neutral flavors are a plus. On the other hand, unrefined oil is simply pressed and bottled so it retains its original nutrient content, flavor and color. Unrefined oils add full-bodied flavor to dishes and are best used for low- or no-heat applications.

Fats and Oils: Fats have had a bad reputation in the past, but people are starting to realize that we need them to stay healthy. Fats are one of the three major nutrients of the human diet. The other two are carbohydrates and protein. Fats and oils are one and the same. The only difference is that oils are liquid at room temperature and fats are solid the latter was titrated with 0.025 MNa_2S_2O solution.

MATERIAL AND METHODS

Determination of Acid Value

Acid value was determined according to the procedure of Cox and Pearson (1962). Dissolved

5 g of oil in 50 ml solvent in 100 ml conical flask. Then one or two drops of Phenolphthalein indicator was added. Titrated the contents against 0.1 N Potassium hydroxide and was shaken constantly until a pink color which persists for 15 seconds was obtained from the end point, AV was calculated.

Determination of Saponification Value

Saponification value was determined according to the procedure of William Horowitz (1975). Weighed 3 g sample into a flask and 25 ml of methanolic KOH was added to it and mixed well. Then a blank was also prepared by taking 25 ml of methanolic KOH. Then the air condenser was connected to the flasks and the contents in flasks were reflected to boil gently for about 1 hour. After that the flask and condenser were cooled, separated from the condenser and about 1 or 2 drops of Phenolphthalein indicator was added and then titrated against 0.5N HCL until the pink color just disappeared. From the end point SV was calculated.

Determination of Iodine Value

To 5 ml of the chloroform solution of the oil, 5 ml of 0.2 M Iodine monochloride was added. The mixture was kept in fume cupboard for 10 min. and 5ml of 10% KI and20 ml of water were added. The mixture was thoroughly mixed and titrated to a colourless end point with 0.025 M $Na_2S_2O_3$ solution. The control was treated in a similar way (Bailey, 1951).

Determination of Peroxide Value

Peroxide value was determined according to the method of (AOCS, 2009). Exactly1.0 g of KI and 20 ml of solvent mixture (glacial acetic acid: chloroform, 2:1 v/v) were added to 1.0 g of the oil sample and the mixture was boiled for one minute. The hot solution was poured into a flask containing 20 ml of 5% KIO_3 solution. A Few drops of starch solution were added to the mixture and the latter was titrated with 0.025 MNa_2S_2O solution.

RESULTS AND DISCUSSION

Table 1: Physico Chemical parameters of Edible oils

Parameter	Type of edible oil								
	Olive	**Sunflower**	**Corn**	**Castor**	**Coconut**	**Gingerly**	**Almond**	**Peanut**	**Palm**
AV (%)	0.504	0.224	0.168	4.5	5.3	7.4	0.8	4.2	1.8
IV (g)	63.4	120	105	62.5	48.3	65.9	51.2	45.6	60
SV (Na/g)	47.68	78.54	91.16	150	210	145	178	176	134
PV (g)	9.33	17.0	23.2	11.5	25.6	48.3	12.5	47	26
FFA (%)	0.338	0.225	0.113	1.25	0.46	0.32	0.56	0.92	0.53

CONCLUSION

Some of the commonly available vegetable oils were selected for the present study. Analysis of the chemical parameters of these oils showed great variation with respect to the reported values of each parameter. Iodine values analyzed for the oils showed great variation from the standard values. Changes were also observed in the case of saponification values. This indicates that the oils available in the market are not pure. Adulteration with other cheap oils might be the reason for the reported changes observed in the oils. Analysis of peroxidation value and acid value indicated that the oils are not fresh.

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