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Spectrophotometric Analysis of the Different Brands of Cooking Oil: It's Implication to Human Health

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Abstract - *This study focused on the implications of using the different brands of cooking oil to human health. Canola oil, corn oil and sunflower oil were used as samples. The physical properties such as color, boiling point and specific gravity were determined. Also, the chemical properties, namely, cholesterol content and triglyceride content were determined and compared to standard values. These became the bases for determining the implications of the different brands of cooking oil to human health. The color of canola oil is clear light yellow; corn oil is pale yellow while sunflower oil is light yellow. The boiling point for canola oil, corn oil and sunflower oil are 248^{0}C, 238^{0}C and 242^{0}C while the specific gravity are 0.921, 0.898 and 0.908 respectively. The cholesterol content of 284.337 mg/dL, 278.715mg/dL and 334.94mg/dL for canola oil, corn oil and sunflower oil respectively indicates that the cholesterol content of these cooking oils are all above the desirable limit of <200 mg/dL. On the other hand, the triglyceride content is 46.467mg/dL, 35.729 mg/dL and 42.975mg/dL which is lower than the normal range of less than 150 mg/dL. and signifies that these cooking oils have lower triglyceride content.*

***Key Words*: boiling point, canola oil, cholesterol content, corn oil, specific gravity, sunflower oil, triglyceride content**

1.INTRODUCTION

Many people these days are becoming conscious of their health. Lots of health problems arise due to lifestyle and eating habits of the people especially now that many fast food chains are growing in numbers. Food served mostly contains fats and oils.

Oil is any of a large class of substances that are typically unctuous, viscous, combustible, and liquid at ordinary temperature. Oils are most commonly used for food purposes like those from plant origins such as legumes like soy and peanut. Other examples of these are sunflower oil from sunflower seeds, canola oil from canola seed and pumpkin; corn oil from cereals and grains of corn; and other oils coming from fruits like olive, palm, walnut, hazelnut, grape seed and sweet almond: and cotton. There are also animal oils that are treated as dietary supplements.

Fats and oils are considered as important nutrients in the human body because they are the major source of energy. Fats differ in oils only in their physical form. At room temperature, fats are solid while oils are in the liquid form. They belong to the substance called lipids [1].

Most of the commercial fats and oils consist of the lipid class called triglycerides. These are fatty acids linked by ester bonds to glycerol. The triglycerides are fats in the bloodstream that can affect our body by hardening and narrowing of the arteries that can cause arterial damage leading to a heart attack or stroke if left untreated.

Aside from triglycerides, the bloodstream also contains two more types of lipids that affect the cardiovascular health: these are the low-density lipoprotein cholesterol and high-density lipoprotein cholesterol. Low-density lipoprotein, also known as LDL or "bad" cholesterol like triglycerides can clog the arteries. When too much LDL (bad) cholesterol circulates in the blood, it can slowly build up in the inner walls of the arteries making them narrow and less flexible. If a clot forms and blocks a narrowed artery, a heart attack or stroke can result. [2].

On the other hand, the high-density lipoprotein, HDL or "good" cholesterol, helps the body in eliminating LDL cholesterol and triglycerides from the arteries. People with a high HDL cholesterol levels have low incidence of heart disease. The cholesterol level can be affected by several factors like age, gender and family health history, but a healthy diet can counter these effects. [3].

Ward [4] said that fats and oils provide essential fatty acids for well-being. Example of this is omega-3 fatty acids which are good for the heart. Moreover, fat also transports vitamins A, D, E, and K into and around the body, and it also provides calories. In addition, fat adds to eating satisfaction because it's filling and tasty.

A lot of researches had been done in the past regarding vegetable oils, but this research will help the consumers to determine which of the most common vegetable oils like corn oil, canola oil and sunflower oil is healthier and best suited for consumption considering the physical as well as its chemical properties. However, in dealing with total cholesterol content of the oil, the amount of low density lipoprotein (LDL) and high density lipoprotein (HDL) were not considered.

2. OBJECTIVES OF THE STUDY

2.1. To determine the physical properties of the different brands of cooking oil in terms of the following:

2.1.1. color
2.1.2. specific gravity.
2.1.3. boiling point

2.2. To assess the chemical compositions of the different brands of cooking oil in terms of:
2.2.1. cholesterol content
2.2.2. triglycerides content

2.3. To evaluate the implications of the results of the physical and chemical properties of the different brands of cooking oil to human health.

3. MATERIALS AND METHODS

3.1. Determination of the Physical Properties of Oil

Canola oil, corn oil and sunflower oil were used as samples. The physical properties of oil such as color, boiling point and specific gravity were determined. Color of the oil was checked by placing the beaker with the sample on top of a white paper. Boiling point was determined by heating 30 mL of the sample until it boils, the temperature was taken and recorded. On the other hand, the specific gravity was taken using formula (1).

$$Specific\ gravity = \frac{Density}{Ref\ density} \quad (1)$$

3.2. Determination of the Chemical Properties of Cooking Oil

The samples of cooking oil were analyzed in terms of their cholesterol content and triglycerides content. Three trials were done for each sample of oil to verify the result. Spectrophotometer was used in determining the chemical properties of the three brands of cooking oil.

3.2.1. Cholesterol Content

In determining the cholesterol content, three test tubes were prepared for each sample of oil. In one test tube, one mL of activated reagent and 0.01 mL of oil was placed and mixed well. In the second test tube, 1.0 mL of reagent blank was used and in the third test tube, 1.0 mL of activated reagent was mixed well with 0.01 mL of the standard reagent. The third test tube served as the control. All test tubes were incubated at room temperature for 10 minutes, then the amount of cholesterol in the standard and sample versus reagent blank at 500nm was recorded using spectrophotometer.

To determine the total cholesterol for each sample, formula (2) was used.

$$Total\ Cholesterol\ (mg/dL) = \frac{Au}{As} \times 200 \quad (2)$$

Where: Au = absorbance value of the sample
As = absorbance value of the standard
200 = the concentration of the standard (mg/dL)

3.2.2. Triglyceride Content.

Three test tubes were prepared for each sample of cooking oil. The first test tube served as control containing 1.0 mL of activated reagent and 0.01 mL of the standard reagent. These were mixed well and incubated for 10 minutes. In the second test tube, 1.0 mL of reagent blank was placed while in the third test tube, 1.0 mL of the activated reagent and 0.01 mL of oil was mixed and incubated for 10 minutes at room temperature. After this time, the triglyceride content of the standard and sample versus reagent blank at 500nm was recorded using spectrophotometer

Data collected were used in the computation of the triglyceride content of the different brands of cooking oil. The formula used is shown in (3).

$$Ttiglyceride\left(\frac{mg}{dL}\right) = \frac{Au}{As} x200 \quad (3)$$

Where: Au = absorbance value of the sample
As = absorbance value of the standard
200 = the concentration of the standard (mg/dL)

4. RESULTS AND DISCUSSION

4.1. Physical Properties of Different Brands of Cooking Oil.

Table 1 presents the physical properties of the three samples of cooking oil. As seen from the table, the color of canola oil is clear light yellow; corn oil is pale yellow while sunflower oil is light yellow. This may be due to the maturity of seeds used as raw material in the production of canola oil and corn oil. On the other hand, the color of sunflower oil was due to the maturity of the sunflower plant used. Refining of the oil also affects the color of the three samples [5].[6].

It can also be noted that the boiling point of canola oil is 248^{0}C, corn oil is 238^{0}C and sunflower oil is 242^{0}C. The boiling point of cooking oil varies on the type of oil considering the chemistry of cooking oil and how it behaves when heated.

Oils are generally groups of large, complex molecules. These mixtures of compounds begin to break down when heated. First, they will begin to smoke called the smoke point, then later will approach the flash point, at which

time they can start to burst into flame. Before oil begins to boil, it has already begun to smoke and decompose from the heat.

The components, origin, as well as the level of refinement of cooking oils greatly affects the smoke point of cooking oils. When the level of refinement increases and the free fatty acid content decreases, the smoke point tends to increase.[7].

The specific gravity is 0.921, 0.898 and 0.908 for canola oil, corn oil and sunflower oil respectively. The specific gravity is not altered during refining, however, once the coloring matters and some gumming materials have been removed after refining, the weight of the oil is affected [8].

Table -1: Physical Properties of Different Brands of Oil

Physical Properties	Canola Oil	Corn Oil	Sunflower Oil
Color	Clear Light yellow	Pale yellow	Light yellow
Boiling Point	248 ^{0}C	238 ^{0}C	242 ^{0}C
Specific Gravity	0.921	0.898	0.908

4.2. Chemical Properties of Cooking Oil.

Table 2 presents the chemical properties of cooking oil particularly cholesterol and triglyceride content of the three samples of oil.

Table-2: Chemical Properties of Different Brands of Cooking Oil

Brands of Oil	Total Cholesterol Content (mg/dL)	Triglyceride Content (mg/dL)
Canola Oil	284.337	46.467
Corn Oil	278.715	35.729
Sunflower Oil	334.94	42.975

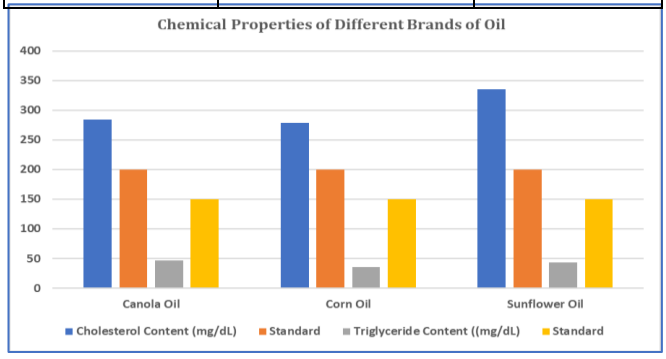

Chart-1: Chemical Properties of the Different Brands of Cooking Oil.

As shown in table 2 and in chart 1, canola oil has an average total cholesterol content of 284.337 mg/dL, corn oil has 278.715 mg/dL and sunflower oil has 334.94 mg/dL. It can be noted that all the total cholesterol content of the three brands of cooking oil fall under high risk since all the values are greater than 240 mg/dL. [9].

Also, corn oil has the lowest triglyceride content of 35.729 mg/dL, followed by sunflower oil with a triglyceride content of 42.975 mg/dL. Canola oil has the highest triglyceride content of 46.467 mg/dL. It can be noted that the amount of triglycerides of the three brands of cooking oil fall under the desirable level which is less than 150 mg/dL. [9].

These values are due to the presence of saturated fats, unsaturated fats and other components of the three brands of oil.

5. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

5.1. The physical properties like color, boiling point and specific gravity of canola oil, corn oil and sunflower oil were successfully determined.

5.2. The average total cholesterol of canola oil, corn oil and sunflower oil are all above the desirable limit of <200 mg/dL.

5.3. The average total triglyceride content of canola oil, corn oil and sunflower oil fall within the desirable limit of <150 mg/dL.

5.4. Consumers should be selective in buying cooking oil to have a healthy food intake.

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BIOGRAPHY

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