

OIL ANALYSIS

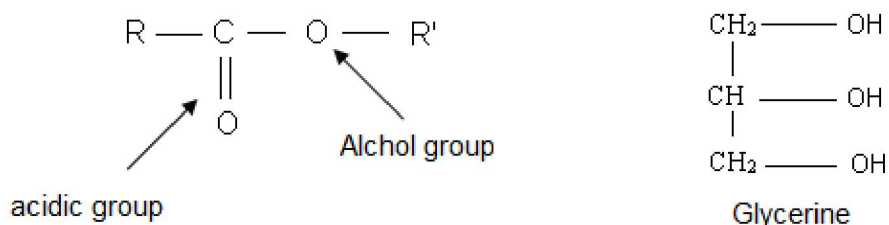
AIM : In this experiment, the application of analyzes such as free acid number, iodine number, peroxide number and saponification number will be examined from the chemical analysis methods used to characterize the oils.

CORPORATE INFORMATION:

Solid and edible oils are called organic substances called lipids. Lipids are components of plants and animals that are insoluble in water but which are soluble in ether or relatively non-polar organic solvents. Due to these properties, lipids are separated from the two basic groups of foodstuffs, proteins and carbohydrates. Lipids are divided into two subclasses according to their hydrolysis (saponification) properties in basic solutions. The steroids cannot be saponified while solids and oils and candles are saponified. Fats and oils used in nutrition; dairy products (cream, butter), animal fats are composed of solid vegetable oils (margarines) and liquid vegetable oils (corn oil, cottonseed oil, sunflower oil, olive oil soybean oil).

Structure of fats and oils:

Fats are ester compounds. In the structure of the esters there are both alcohol groups and an acidic group.

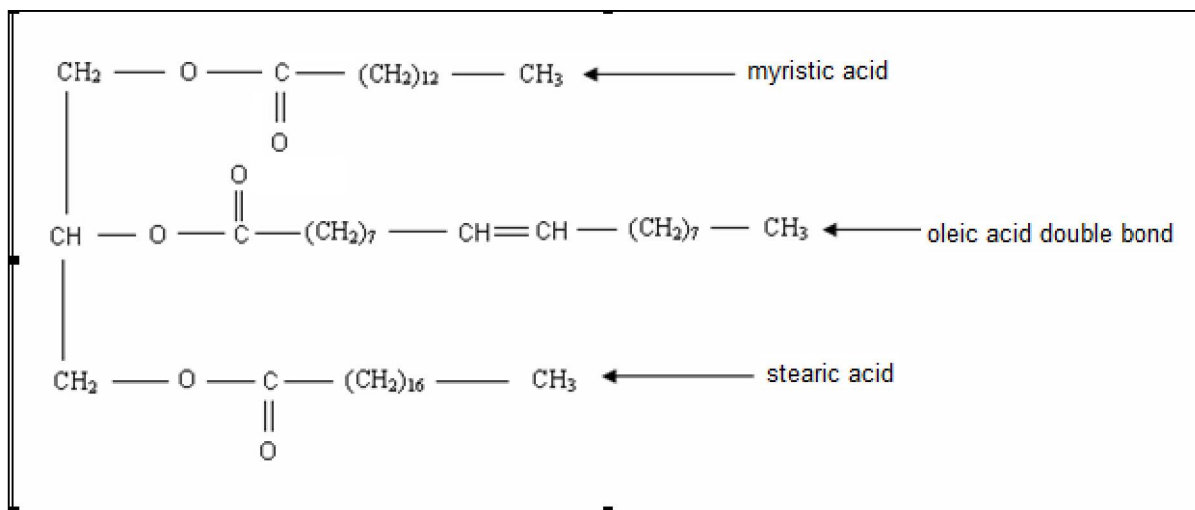


The group of alcohols in the oils is glycerin (glycerol). In contrast, the acidic components of the oils can be very different compounds. These acids are straight-chain carboxylic acids. They contain 10 to 20 carbon structures. They always contain an even number of carbon atoms. Although the carboxyl group does not carry any functional groups other than -COOH, they can carry double bonds. Table 1 shows the most common saturated and unsaturated carboxylic acids obtained from fats

Name of acid	Molecular formula	Boiling point °C
lauric	C ₁₁ H ₂₃ COOH	44
myristic	C ₁₃ H ₂₇ COOH	58
palmitic	C ₁₅ H ₃₁ COOH	63
Stearic	C ₁₇ H ₃₅ COOH	70
cis-oleic	C ₁₇ H ₃₃ COOH	13
cis-cis-linoleic	C ₁₇ H ₃₁ COOH	-5
cis-cis-cis-linoleic	C ₁₇ H ₂₉ COOH	-11

Table 1. Most known acids from oil

Fats and oils are carboxylated esters of glycerine. Since glycerin contains three - OH groups, a glycerin molecule can be attached to three different acid molecules. A typical fat molecule is shown below.



The above fat compounds are known as triglycerides. Triglycerides are complex mixtures. Triglycerides can contain two or three different fatty acids as well as similar fatty acids. Animal and vegetable oils are insoluble in water but slowly soluble in boiling aqueous alkaline solutions. As a result of this event, the fat molecule is divided into glycerine and carboxylated acid mixture. The difference between solids and oils depends primarily on the melting point. If these groups are saturated, the glycerin esters are generally solid. Double bonds in the carboxylic acid group reduce the melting point. The carboxylic acid groups in the oils are highly unsaturated. Generally, natural fats and oils do not contain pure triglycerides, they are a mixture of these. When the composition of an oil is hydrolyzed, it is expressed in terms of the acids obtained. For example, olive oil contains 83% oleic acid, 6% palmitic acid, 4% stearic acid and 7% linoelic acid and 4% stearic acid and 7% linoic acid.

General information about edible oils

1. Butter: Cream, cream, milk and yogurt with the appropriate method and tools obtained by processing the technique, taste, smell and consistency of a dairy product. After melting at a temperature not exceeding 60 °C, the foam is purified as much as possible from its sediment and water and with a minimum of 98% milk fat in it, it is called pure oil.

Butter is divided into classes according to their characteristics according to their types and types.

1.1 Breakfast Butter (Extra, Class I, Grade II)

1.2 Kitchen Butter (Extra, Class I, Class II)

1.3 Simple fat (Extra, Class I, Class II)

2. VEGETABLE OILS:

2.1 Olive oil:

According to the production of olive oil and according to the methods used in production are divided into three classes.

a) Natural: Edible natural olive oil, olive tree fruit (olive) obtained by applying the physical process of "no chemical treatment from clear green to yellow in color, in its own taste and smell natural food can be consumed as natural food oil. According to the taste, Natural Extra Virgin, Natural Extra-Extra, Natural Second, Natural Third is divided into four separate groups.

b) Refined: Refined olive oil, free fatty acids due to the amount or properties of natural olive oil that can not be consumed as natural food, natural triglyceride structure, resulting in a change in the refining methods, resulting in a clear, sedimentless, yellow color, distinctive taste and smell, refining oil There is only one type of refined olive oil.

c) Refined + Natural Type: This edible type olive oil is a mixture of natural edible olive oil and edible refined olive oil and its characteristics can be consumed as natural and refined olive oil. Food Type Natural + Refined Olive Oil is divided into three groups as Riviera, Type A, Type B according to the amount of fatty acids it contains.

2.2 Sunflower Oil:

It is a refined, unique color, taste and odor obtained from the seeds of sunflower plant and it is used as nutrient which is liquid at room temperature. Cooking sunflower oil has only one class, Refined Cooking Sunflower Oil.

2.3 Corn Essence Oil:

It is the oil which is obtained from the embryos separated from corn seeds, refined, has a unique color taste and odor, which is liquid at room temperature and used as nutrients. Cooking corn oil has only one class, namely "Refined Cooking Corn Oil".

2.4 Soybean Oil:

Oil obtained from the grains of soybean, refined, unique color, taste and smell, liquid at room temperature and used as nutrients. Edible soybean oil has only one class, "Refined Edible Soybean Oil.

3.Margarins (Vegetative and Animal oil)

Margarines are divided into three classes according to their place of use

3.1 Breakfast cereals

3.2 Kitchen margarine

There is only one type of breakfast and kitchen margarine based on the amount of oil.

3.3 Food industry margarine

Food industry is divided into two types: margarine, type I (containing at least 99% oil) and Type II (containing at least 80% oil). Margarine is divided into two types as salt and salt-free according to the amount of salt.

REQUIRED STANDARDS

For acid number, iodine number, peroxide number, saponification number in

TS 341, 886, 888, 890, 1331, 2812 The given values are shown below.

1. Acid number

	at most % oleic acid	at most % oleic acid
Butter		Olive Oil
Extra.....	0.18	Refined 8 ... 1.8
First Class...	0.27	Naturel 1.5
II. Class.....	0.36	
Kitchen Butter		Sunflower oil..... 0.3
Extra.....	0.27	Corn oil ü0.3
I. Class	0.56	Soybean oil0.3
II. Class	0.81	

Vegetable	Margarine
Extra	Breakfast ... 1.5
Class.....	Kitchen 0.2
II. Class	Food Industry
	Type I.....0.2
	Type II 1.5

2. Iodine number:

Butter	Olive Oil 78-80
Sheep butter ..	Sunflower oil..110-143
Goat butter	Corn 130-128
Cow butter ...	Soybean oil..... 120-143

3. Peroxide Number

	most me / kg
Butter	10

Olive oil

Natural..... 20

Refined 10

Naturel + Refine12

Other vegetable oils10

Margarines.....9

4. Saponification number

Vegetable oils184-196

EXPERIMENTAL

The following oil sample is applied to the following chemical oil analysis methods.

1. Number of acids

The free fatty acids present in the oils are also expressed as the weight in mg of potassium hydroxide necessary for the neutralization of one gram of oil, as indicated in percent of the total oleic acid.

Application:

Weigh 5-10 g of the sample (solid dissolved, filtered) into a solution. Dissolve in 25 mL of alcohol-ether (1: 1) mixture. A few drops of phenolphthalin is dropped and titrated to a constant pink color with 0.1N NaOH solution.

$$\text{Free fatty acids} = \frac{VxNx28.2}{m} \text{ (\% oleic acid)}$$

$$\text{Acid number} = \frac{VxN}{m} \times 56 \text{ (Required KOM amount for 1 g sample)}$$

Here:

V: volume of consumptive NaOH

N: Real Normality of NaOH

m: sample amount g

2. Iodine number

The iodine number is a measure of the unsaturation of the oils and is expressed as the weight of the iodine bound by the fat oil in practice.

Application:

0.2 g of fat sample is weighed into an flask. Dissolve the oil by adding 15 mL of carbon tetrachloride (or chloroform). After 20 ml of Hanus solution (or Wijs solution) is added tightly, shake gently and stand in a dark place for 30 minutes. At the same time as a non-oil test is done in a parallel witness. Then 1 g of KI and 50 mL of water are added to each flask removed from the dark and titrated with 0.1 N sodium thiosulphate solution. When light yellow, titration is stopped and 2 ml starch solution is added and shaken. The titration is continued until the blue color disappears. The same procedures are carried out in the witness experiment.

$$\text{Iodine number} = \frac{(V_2 - V_1) \times N}{m} \times 12.7$$

Here:

V_2 : consumptive sodium thiosulphate solution amount mL for blank experiment

V_1 : consumptive sodium thiosulphate solution amount mL for sample

N: Real normality of sodium thiosulphate

m: sample amount g

3. Peroxide number:

Measure the amount of active oxygen in oils, peroxide oxygen in 1 kg oil is the number of millimeter grams

Application:

Weigh up to 2 g of sample into an flask. Place 30 mL (3: 2) acetic acid-chloroform mixture (18 mL glacial acetic acid + 12 mL chloroform), stir until the oil dissolves. Then add 0.5 g of KI and leave for 5 minutes in the dark after stirring. 30 ml of distilled water is added to the dark-colored flask and titrated with 0.002 N sodium thiosulphate solution until yellow, then 0.5 mL of starch solution is added and the blue color disappears. At the same time, without the use of samples, the test should not contain free iodine.

$$\text{Peroxide number} = \frac{V \times N}{m} \times 1000$$

Her:

V : consumptive sodium thiosulphate solution

N: Real normality of sodium thiosulphate

m: sample amount g

4. Saponification number:

1 g is the weight of the potassium hydroxide in mg as necessary for the saponification of the oil.

Application:

Take up to 2 g of oil into a flask. 25 mL of ethanolic potassium hydroxide (0.5N) is added. Back is connected to the coolant. It is slowly boiled with occasional stirring. After boiling for 60 minutes, the soap solution is titrated with 0.5 N HCl solution by adding 4-5 drops of phenolphthalein. In addition, a witness test is carried out with an ethanoic KOH solution.

$$\text{Saponification number} = \frac{(V_2 - V_1) \times N}{m} \times 56$$

Here:

V_2 : consumptive HCl solution amount mL for blank experiment

V_1 : consumptive HCl solution amount mL for sample

N: Real normality of HCl

m: sample amount g