DETERMINATION OF SAPONIFICATION VALUE

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INTRODUCTION

Saponification is the hydrolysis of esters. Oils and fats are the fatty acid esters of the trihydroxy alcohol, glycerol. The saponification value of an oil is defined as the number of milligrams of potassium hydroxide required to neutralise the fatty acids resulting from the complete hydrolysis of 1 g of the sample. A soap is formed during saponification, for example:

$$C_3H_5(C_{17}H_{35}COO)_3 + 3KOH = C_3H_5(OH)_3 + 3C_{17}H_{35}COOK$$

Stearin Glycerol Potassium stearate

The esters of the fatty acids of lower molecular weight require more alkali for saponification, so the saponification value is inversely proportional to the mean of the molecular weights of the fatty acids in the glycerides present.

As many oils have somewhat similar values, the saponification value is not, in general, so useful for identification purposes. It is useful for detecting the presence of oil and fats which contain a high proportion of lower fatty acids.

I SAMPLE PREPARATION

The fish lipid is extracted with C-M mixture and the solvent evaporated using the rotary evaporator. About 0.2-0.5 g of lipid is used. The approximate sample sizes to be used for each type of lipid is as follows:-

Type of lipid	Sample size (g)	N/2 KOH solution (ml)
fish lipid	0.2 – 0.5	10
animal fat	0.5 – 1.0	20
plant oil	0.5 – 1.0	20
wax	1.0 – 2.0	20

II APPARATUS

Bulb condensers
Erlenmeyers flasks (50-300 ml depending on sample size)
Water bath
Pipettes
Burette

III REAGENTS

a) 0.5N HCl standard solution

Use 1N HCl standard solution and dilute exactly two times.

b) 0.5N Ethanolic potassium hydroxide standard solution

Weigh 35 g of KOH, dissolve in 20 ml of water, then make up to 1000 ml with 95% (v/v) ethanol or absolute alcohol.

c) Indicator

Phenolpthalein
Take 1 g of phenolpthalein and make up to 100 ml with 95% ethanol.

Methylene blue
Take 0.1 g of methylene blue and make up to 100 ml with water.

IV PROCEDURE

1. Take 0.2 to 0.5 g of lipid in a 50-100 ml Erlenmeyer flask.
2. Add 10 ml of 0.5N ethanolic potassium hydroxide solution and mix.
3. Heat at 80-85°C in a water bath for 30 min.
4. Cool to between 30-40°C liquid stato, then titrate with 0.5N HCl standard solution (Add 2-3 drops of indicator).
5. Carry out a blank test (without lipid).

V CALCULATION

$$\text{Saponification value (mg/g)} = \frac{28.05^* \times (A - B) \times F}{S}$$

where S = sample weight
A = titration volume of blank (ml)
B = titration volume of sample (ml)
F = Factor of 0.5N HCl standard solution

* Half of molecular weight of KOH

REFERENCES

Jacobs, M.B. (1973). The chemical analysis of foods and food products (Reprint of 3rd Ed): 380-381.

Pearson, D. (1976). The chemical analysis of foods (7th Ed):491-492.