



EXTRACTION AND STUDIES ON SAPONIFICATION VALUES OF SOME NON EDIBLE SEED OILS FROM ARID ZONE OF RAJASTHAN

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Abstract— The seed oils are a kind of secondary metabolites. A number of plants and trees supply good amount of oil seeds. Some of them are edible while others are non edible.

The non edible oils could be applied in industrial fields. These fields are soap manufacturing, paint and varnish, lubrication, animal food, fuel blending etc. The selection of oil for soap manufacturing can be done by saponification value. It is the number of milligrams of potassium hydroxide required to saponify 1g of fat under the conditions specified. It is affected by chain length of all the fatty acids present. The present paper deals with the extraction and determination of physicochemical properties of five seed oils with special reference to saponification values. The oils were extracted from seeds using petroleum ether as solvent and the acid values were determined by AOAC and ASTM methods. The acid values were found from the range of 162 to 292. It was concluded that the oils with high Saponification Value have good cleansing action than the lower ones.

Index Terms— Arid zone, cleansing action, potassium hydroxide, Saponification Value, seed oils.

I. INTRODUCTION

Fats and oils are the forms of energy stored in many organisms. These are triglycerides or derivatives of fatty acids (carboxylic acids with hydrocarbon chains of 4 to 36 carbons) may be

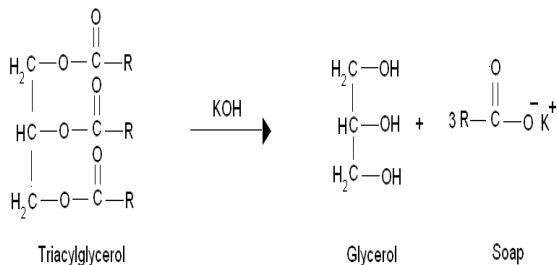
saturated or unsaturated. Triacylglycerols are non polar, hydrophobic and insoluble in water because the polar hydroxyls of glycerol and the polar carboxylates of the fatty acids are bound in ester linkages.

When fats or oils are hydrolyzed under basic conditions, glycerol and salt of the corresponding fatty acid are obtained. This process is termed as Saponification means "soap making". Soap industry is one of the important commercial agencies. An industrial user should know the amount of free fatty acid present in the oil. The amount of free fatty acid is estimated by weight of alkali required for neutralization. For this purpose a known amount of oil/fat is warmed with strong aqueous caustic soda solution. By this the free fatty acids are converted into soap. This soap is removed and the amount of remaining fat is determined. This amount is subtracted from the initial amount of fat taken for the test.

The number of milligrams of potassium hydroxide required neutralizing the fatty acids present in one gram of oil or fat resulting from the complete hydrolysis is termed as saponification value. The information about the carbon chain and the average molecular weight of all the fatty acids present are obtained by this value. For example the long chain fatty acids have low saponification value as a fewer number of carboxylic functional groups are present per unit mass of the fat and have high molecular weight also, while the small fatty acids has high

saponification value due to more number of carboxylic functional groups in per unit mass of the fat.

Fats (triglycerides) upon alkaline hydrolysis (either with KOH or NaOH) yield glycerol and potassium or sodium salts of fatty acids (soap).¹⁰



The Arid zone of Rajasthan is a good reservoir of desert plants which are adapted in dry climatic conditions. These plant species produce tones of seeds per year containing seed oil as a main constitute.¹⁻⁵ Some of them are suitable for human consumption called edible seeds/oils while others are non edible. Soap manufacturing is the most common application of these non-edible oils.

II. MATERIAL AND METHODS

A. Plant Species

The details of all the plant species were selected for analysis are given in Table .1⁶⁻⁸

Sp No	Botanical name	Common name	Family
1	<i>Nigella sativa</i>	Kalonji	Ranunculaceae
2	<i>Citrullus collycanthus</i>	Watermelon	Cucurbitaceae
3	<i>Terminaria catappa</i>	Wild almond	Combretaceae
4	<i>Leptadenia pyrotechnic</i>	Khimp	Asclepiadeceae
5	<i>Pergularia daemia</i>	Gadaria ke bel	Asclepiadeceae

B. Raw Material

The seeds for analysis were collected from wild regions of Jodhpur and adjoining areas. The seeds were dried in shade to remove excess of moisture. These were grinded to fine powder and subjected for analysis.



Nigella sativa



Citrullus collycanthus



Terminaria catappa



Leptadenia pyrotechnica



Pergularia daemia

Plants and seeds of selected species

C. Moisture content

The moisture content in the seeds were kept 1-2% during analysis.

D. Extraction of oil

The known weight of grounded seeds were filled in a thimble and subjected in the Soxhlet Apparatus. Petroleum ether of boiling range 60-80°C is used for extraction. The solvent after extraction was recovered by distillation. The oil was filtered through sodium sulphite bed to remove moisture and stored in air tight viols.

E. Determination of Saponification Value

1 gm. of oil was taken into the round bottomed flask and 20 ml of 0.5 N alcoholic KOH solution was added to it. The same procedure was

followed without taking oil for blank titration. Both round bottomed flasks were refluxed for 1 hour. After reflux, both the round bottomed flasks were allowed to cool⁸⁻⁹.

Both the samples were titrated using 0.5 N HCl with phenolphthalein indicator. The disappearance of pink color was recorded as the end point. Calculation was done by following formula-

Saponification Value = (Titre value of blank in ml – Titre value of sample in ml) x N KOH x Equivalent wt. of KOH.

III. RESULTS AND DISCUSSION

The saponification values obtained in this study has been shown in the Table.2. The lowest value was found for the seed oil of *Termenaria catappa* as 162 mg of KOH. The highest value was found for the seed oil of *Pergularia daemia* as 292.

The low value indicates the soft nature of soap with good cleansing action while the high value produces hard soap with fair cleansing action. It is clear from the above study that these oils could be applied for soap manufacturing with studies of other seed oil values.¹¹⁻¹²

Table .2. Saponification values of seed oils

SR.NO.	PLANT SPECIES	SAP.VALUE	CATEGORY
1	<i>N.sativa</i>	200	Normal
2	<i>C.lanatus</i>	190	Normal
3	<i>T.catappa</i>	162	Low
4	<i>L.pyrotechnica</i>	196	Normal
5	<i>P.daemia</i>	292	High

IV.CONCLUSION AND FUTURE SCOPE

The saponification values obtained provide an idea about the molecular weight, structure of fatty acids and amount of lye for soap manufacturing. Although the accurate composition with percentage of fatty acids is obtained from Gas Chromatography of methyl esters yet the basic clue is obtained from sap values. The high value in case of species no.5 indicates presence of low fatty acids in abundance. The low value in species no.3 indicates good amount of higher fatty acids. The values for species 1, 2 and 4 resembles the normal values for vegetable oils.

The saponification values analyzed in the present study would be correlated to the chemical composition. Since the selected plants

belong to Arid/semiarid climate, hence the commercial production of plants would provide better products. The soap obtained from these oils would be improved by addition of other oils/fats. The hard/soft nature, cleansing action, fluffy nature of foam and most important the skin care would be controlled by these values.

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