



## COMPARATIVE STUDY BETWEEN SOLVENT EXTRACTION PROCESS AND ULTRASONIC PROCESS FOR EXTRACTION OF ROSE OIL AND ROSE WATER BY ROSE PETALS

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**Abstract**

Rose is a popular crop for the both domestic and commercial cut flower. The **rose** is a type of flowering shrub. Its name comes from the Latin word Rosa .The flowers of the rose grow in many different colors, from the well-known red rose or yellow roses and sometimes white or purple roses. Roses belong to the family of plants called Rosaceae .Rose oil is extracted from the rose petals. Rose oil is the essential oil extracted from the petals of various types of rose. Rose ottos are extracted through steam distillation, while rose absolutes are obtained through solvent extraction or supercritical carbon dioxide extraction, with the absolute being used more commonly in perfumery. Ultrasonic extraction is also used for extraction of rose oil. Rose oil were extracted from fresh rose flower by using non polar solvent e.g. n-hexane and cyclo-hexane. The rose water is also obtained by the rose petals. Rose oil and rose water were the main product. Ultrasonic extraction is the removal and recovery f organic analytic from a permeable solid matrix by means of a solvent which is energized by sound energy at frequencies in excess of tose audible to human ear . A technique, also called liquid extraction, for separating the components of a liquid solution. This technique depends upon the selective dissolving of one or more constituents of the solution into a suitable immiscible liquid solvent. For the extraction of rose oil solvent extraction and ultrasonic process were adopted. Thus, the comparative study between the solvent extraction and ultrasonic extraction process for the extraction of rose oil.

**Keywords:-** Rose Oil, Solvent Extraction ,Ultrasonic Extraction, Rose Water , Non Polar Solvents.

**1.INTRODUCTION**

Rose belongs to one of the most popular groups of ornamental plants. Rose is woody perennial flowering plants of the genus. Rosa in the family Rosaceae or the family it bears. There are over a hundred species and thousands of cultivars. They form a group of plants that can be erect shrubs, climbing or trailing with stems that are often armed with sharp prickles. Rose are a popular crop for the both domestic and commercial cut flower. Rose oil is perfume and cosmetic essential oil made from the rose petals. A commercial by –product of a rose petal is rose water. Rose oil being produced in India from ancient times. The Rosa Damascena is widely grown in India. One of the place where Rosa Damascena is extensively grown is Hasayan near Hathras, Uttarpradesh in India. Hasayan is the centre of the rose essential oil manufacturing in India. The rose oil is mostly used for perfumery purpose. The average yield ranges from 1:3000 to 1:10,000. So it is a very costly affair to manufacture the rose oil in India. The principal constituents: Eugenol , Famesol and other acids, geraniol (or citronellol ) , linalool , nerol , noncyclic aldehyde, rhodinol and stearoptene. Indian manufacturer faces competition from Bulgaria, Turkey, Morocco, Ukraine and France where the

cost of manufacturing is too low than in India. The most important country in rose cultivation is Bulgaria. Rose oil production industry had begun in Bulgaria. Today, it is product extracted mostly in Bulgaria and Turkey but many countries including China, France, Lebanon and Afghanistan are also producers. High quality Bulgarian rose oil was priced at \$5,750 US per kg in 2014. Bulgarian and Turkey where rose cultivation centuries old, account for about 80 % to 90% of rose oil production worldwide.

The rose oil is manufactured through traditional distillation process. For the extraction of rose oil, various methods are available such as solvent extraction, steam distillation, ultrasonic extraction, and so many. But we adopted two processes that is solvent extraction and ultrasonic extraction process .To comparative study between solvent extraction and ultrasonic extraction process of rose oil.

**2. METHODOLOGY**

For the process of ultrasonic and solvent extraction the crushed rose petals and non polar solvent cyclo-hexane and n-hexane were taken as a proportion 1:1 i.e 150 each by weight.

### 2.1 Solvent Extraction

Solvent extraction was done by Soxhlet apparatus fig 1. For the extraction of rose oil the soxhlet apparatus was invented by in 1879 by Franz von soxhelet. Liquid-liquid extraction is called as “solvent extraction” and partitioning is the method to separate compounds based on their relative solubility’s in two different immiscible liquids, usually water and an organic solvent. 150 gm of crushed rose petals were added in the extraction chamber which is placed above the boiling flask at the level of siphon arm. Above the extraction chamber condenser were placed through which 150 gm of non polar solvent added. The heating processes were carried out for one hour.

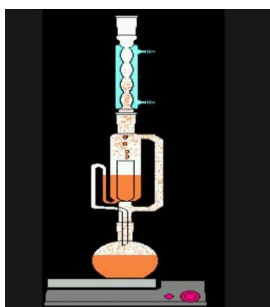


Fig-1: Soxhlet Appratus.

### 2.2 Ultrasonic Extraction Process

Ultrasound is a sound wave with frequencies higher than upper audible limit of human hearing. Ultrasound is no different from audible sound in its physical properties, except in that human cannot hear it. This limit varies from person to person and approx. 20 kHz. The sample of crushed rose petals and non polar solvent were placed in ultrasonic water bath. It was covered by screw cap with the help of ultrasonic probe. The duration of this process was one hour.

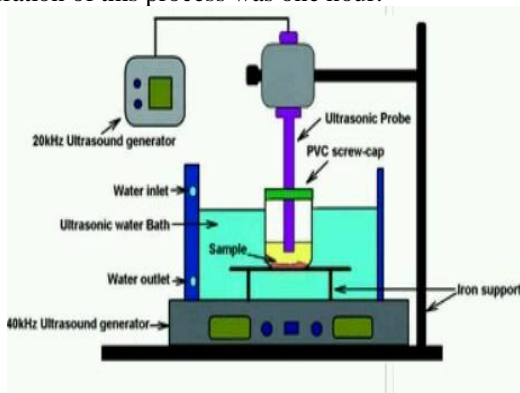


Fig -2: Ultrasonic extraction setup

### 2.3 Separation

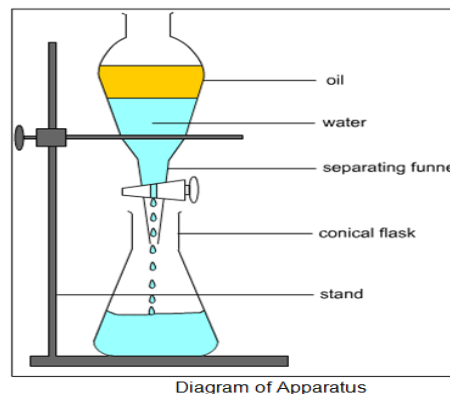


Fig-3: Separation Apparatus

A separating funnel is a piece of laboratory equipment. It is usually made of glass, and is used to remove one from other. The organic and inorganic matters were found in two processes. To separate organic and inorganic matter the separation process were carried out. The matters were placed in separating funnel. The two layer of oil (organic) and water were found. One layer of water is placed in one small bottle which is called rose water. And the another layer which is called organic matter placed in another bottle. In that organic matter the oil and solvent were found. To the extraction of oil vacuum distillation were adopted.

### 2.4 Vacuum Distillation

In this process the vacuum distillation setup as shown in fig 4. Vacuum distillation is a method of distillation whereby the pressure above the liquid mixture to be distilled is reduced to less than its vapour pressure (usually less than atmospheric pressure) causing evaporation of the most volatile liquid. This distillation method works on the principle that boiling occurs when the vapour pressure of a liquid exceeds the ambient pressure. Vacuum distillation is used with or without heating the mixture. This technique is predicted analyte recovers using a theoretical relationship between analyte boiling points and water to air coefficients.

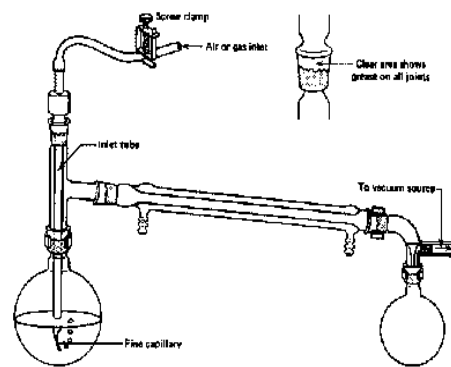


Fig. 100 A vacuum distillation setup.

Fig-4: Vacuum Distillation

### 3. INSTRUMENTATION

#### 3.1 Solvent extraction process

Soxhlet apparatus: - A Soxhlet extractor is a piece of laboratory apparatus invented in 1879 by Franz von Soxhlet. It was originally designed for the extraction of a lipid from a solid material. Typically, a Soxhlet extraction is used when the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. It allows for unmonitored and unmanaged operation while efficiently recycling a small amount of solvent to dissolve a larger amount of material. Description: A Soxhlet Extractor has three main sections: A percolator (boiler and reflux) which circulates the solvent, a thimble (usually made of thick filter paper) which retains the solid to be laved, and a siphon mechanism, which periodically empties the thimble.

**Assembly :** The source material containing the compound to be extracted is placed inside the thimble. The thimble is loaded into the main chamber of the Soxhlet extractor. The extraction solvent to be used is placed in a distillation flask. The flask is placed on the heating element. The Soxhlet extractor is placed atop the flask. A reflux condenser is placed atop the extractor

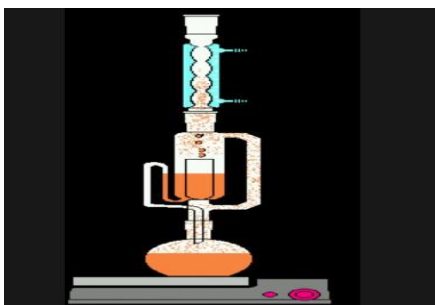


Fig-3.1: Soxhlet Apparatus

#### 3.2 Ultrasonic Extraction Process

Dr. Ian Donald invented the first ultrasound machine in 1957. Ultrasonic extraction must be performed under conditions which protect the hearing of laboratory personnel. The ultrasonic generator may generate heat which may affect the extraction process. Ultrasonic probes become pitted when used for the extraction of abrasive matrices such as soil, thus changing the energy generated and affecting the extraction efficiency of the procedure

### 4 . RAW MATERIAL AND SPECIFICATION:-

#### 4.1 N- HEXANE

(1.94606.0521 Impart ACS For Analysis )

(Specially Dried; Free of Benzene)

Chemical formula -  $\text{CH}_3(\text{CH}_2)_4\text{CH}_3$

Molecular Weight – 86.18g/mol

Boiling point –  $68^\circ\text{C}$

Melting point --  $-96^\circ\text{C}$  to  $-94^\circ\text{C}$

Density –  $655\text{kg/m}^3$

(1lit=0.66kg)

Purity: (GC)

(Hexane isomer + methylcyclopentane)>98.5

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Colour < 10 Hazen

Acidity < 0.0003 meq/g

Alkalinity < 0.0002 meq/g

Benzene (GC) < 2 ppm

Sulphur compound (as S) < 0.005%

Thiophene conforms

Water (KF) < 0.02% Non-volatile substance < 0.001%

#### 4.2. Cyclo-Hexane

1. (CAS NO : 110-82-7)

2. Molecular Formula =  $\text{C}_6\text{H}_{12}$

3. Molecular Weight = 84.16

4. Boiling point =  $80.74^\circ\text{C}$

5. Density =  $779\text{kg/m}^3$

6. Minimum assay (by GC) = 59%

7. Wt. per ml at  $20^\circ\text{C}$  = 0.776-0.780g

MAXIMUM LIMIT OF IMPURITIES:

1. Non-volatile matter = 0.005%

2. Water = 0.1%

### 5. ROSE ESSENTIAL OIL ADVANTAGES

Fragrant and beautiful, rose is one of the best loved flowers on the planet. Did you know, though, that rose essential oil, which is distilled from fresh Damascus roses .Rose essential oil is an antiseptic, an antispasmodic, an aphrodisiac and an antidepressant too, so read on, and find out more about the wonderful benefits of rose essential oil.

### 6. DISADVANTAGES

In some people, rose geranium essential oil can cause rash, irritation and burning sensation when it is applied to the skin. That's why, to be on a safe side, it's best to test the oil before using, as well as consult your doctor for a professional advice.

### 7. PRECAUTIONS OF ROSE ESSENTIAL OIL

Use with caution during pregnancy. Always test for skin sensitivity prior to widespread use and use on the feet when possible. Excessive use of any oil can lead to skin sensitization. Keep out of eyes, ears, or nose. Not all oils are created equal, so test brands carefully, and never use an oil in a way not recommended by its maker.

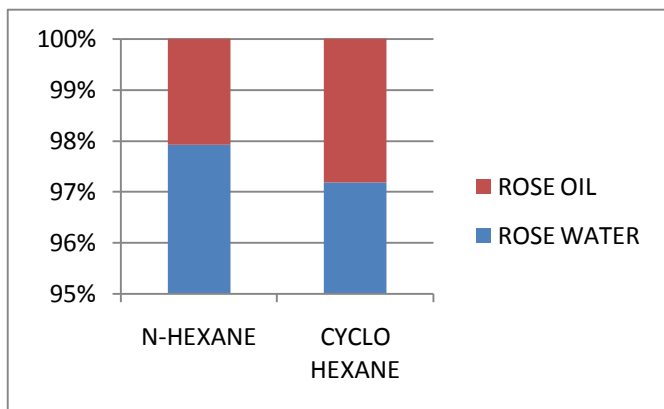
### 8 .RESULT AND OBSERVATION

In this project, we have determine rose oil and rose water prepared.

- 1) Rose oil
- 2) Rose water

Table-8.1: Graph Of Solvent Extraction

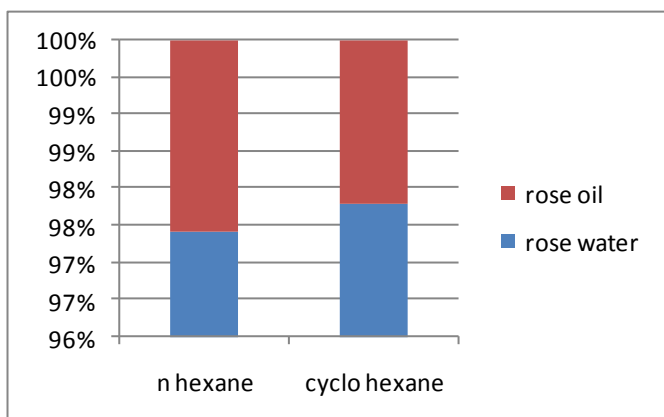
Sr No	Solvent	Rose water	Rose oil
1.	N hexane	68.2	1.45
2.	Cyclo hexane	69	2



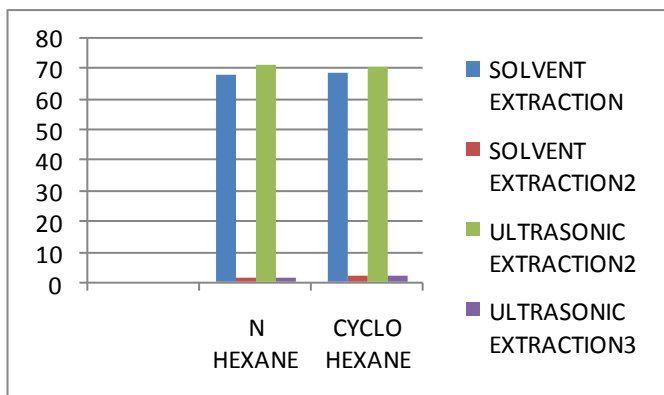
**Fig 8.1: Solvent Extraction**

**Table-8.2: Graph Of Ultrasonic Extraction**

Sr No.	Solvents	Rose Water(Gm)	Rose Oil(Gm)
1	N-Hexane	71.6	1.9
2	Cyclo Hexane	70.8	1.6



**Fig-8.2: Ultrasonic extraction**



**Fig-8.3: Combine Graph Of Solvent Extraction And Ultrasonic Extraction Process**

## 10. CONCLUSION

For the extraction of rose oil and rose water by solvent extraction by soxhelt apparatus and ultrasonic extraction , we concluded ultrasonic extraction was efficient and better than the solvent extraction. The more yield of rose oil were obtained in ultrasonic than the solvent extraction process. The ultrasonic extraction process increased the yield and quality of oil better than the other methods.

## 11. ACKNOWLEDGEMENT

This research work partially supported by Anuradha Engineering College, Chikhli. We thank our colleagues from [Anuradha Engineering College, Chikhli] who provided insight and expertise that greatly assisted the research, although they agree with all of the conclusions of this paper. We also thank Prof.V.D.Gurudasani [Head, Department of Chemical Engineering] for his assistance in using sophisticated analysis equipments.

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