

# **INVESTIGATORY PROJECT ON**

**Extraction of essential oils present in  
Saunf(Aniseed), Ajwain(Carom) and  
Elaichi(Cardamom)**

**Submitted By-**

**Guided by:**

CERTIFICATE

This is to certify that this **“CHEMISTRY INVESTIGATORY PROJECT** on the topic **“Extraction of essential oils present in Saunf(Aniseed), Ajwain(Carom) and Elaichi(Cardamom)”**

has been successfully completed by \_\_\_\_\_ of class – **XII-Science** under the guidance of **MR. ANKUR AGARWAL**

Sir in particular fulfilment of the curriculum of **CBSE** leading to the award of annual examination of the year **2023-2024**.

**Internal  
Examiner**

**Examiner**

**Principal**

**External**

## Acknowledgement

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for his guidance and support in completing my project.

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Name-

Roll No-

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## *Aim of the experiment*

**Extraction of essential oils present  
in Saunf(Aniseed), Ajwain(Carom)  
and Elaichi(Cardamom)**

Aniseed Oil



Cardamom Oil



Carom Oil



# INTRODUCTION

An essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds from plants. They are also known as volatile oils, ethereal oils, aetherolea etc. Essential oils are made up of highly volatile substances which can be extracted from numerous plant species. Distillation based recovery processes such as steam and vacuum distillation are preferred for the extraction of essential oils from plant materials. Virtually all naturally occurring essential oils are made up of hydrocarbons such as camphene, pinene, limonene, phellandrene cedrene, and oxygenated hydrocarbons such as alcohols, aldehydes, esters, ethers, ketones, lactones, phenols and organic acids. The essential oil get their odours from the oxygenated compounds contained in them and these confer stability on the oil against oxidation. The hydrocarbons are less stable and they are responsible for the degradation observed in the oils. The hydrocarbons contained in the essential oils are often removed so that the oils can be more stable and still retain their odours and flavours .

# THEORY

**Steam distillation** is a type of distillation (a separation or extraction process) for a temperature-sensitive plant such as natural aromatic compounds. It once was a popular laboratory method for purification of organic compounds but has become obsolete by vacuum distillation. Steam distillation is still important in certain industrial sectors. Steam distillation is one of ancient and official approved methods for isolation of essential oils from plant materials. The plant materials charged in the alembic are subjected to the steam without maceration in water. The injected steam passes through the plants from the base of the alembic to the top. Steam distillation is a method where steam flows through the material as shown in diagram below. This steam functions as agents that break up the pores of the raw material and release the essential oil from it. The system yields a mixture of a vapour and desired essential oil. This vapour is then condensed further and the essential oil is collected. The principle of this technique is that the combined vapour pressure equals the ambient pressure at about 100 °C so that the volatile components with the boiling points ranging from 150 to 300 °C can be evaporated at a temperature close to that of water. Furthermore, this technique can be also carried out under pressure depending on the essential oils extraction difficulty.

We are all familiar with the pleasant odours coming out from flowers, spices and many trees. The essence or aromas of plants are due to volatile oils present in them. These smelling volatile oils present in plants are called essential oils. Cinnamon, clove, cumin, eucalyptus, garlic, jasmine, peppermint, rose, sandalwood, spearmint, thyme, wintergreen are a few familiar examples of valuable essential oils. The term "essential oils" literally means "oils derived from the essence" of plants. Essential oils are mainly used for their pleasant odours and flavors in perfumes and as flavoring agents in foods. Some are used in medicines (e.g., camphor, wintergreen, eucalyptus) others as insect repellants (e.g., citronella). Chemically essential oils are composed of complex mixtures of ester, alcohols, phenols, aldehydes, ketones and hydrocarbons. They are essentially non-polar compounds and are thus soluble in non-polar solvents such as petroleum ether, benzene etc. Essential oils may occur in all parts of the plant, but they are often concentrated in the seeds or flowers. They are obtained from the plants by the process of steam distillation and extraction. The technique of steam distillation permits the separation of volatile components from non-volatile materials without raising the temperature of the distillation above 100° C. Thus steam distillation reduces the risk of decomposition of essential oils.

### **CAROM OIL(AJWAIN)**

- Botanical name : Trachyspermum ammi
- Common Method of Extraction : Distillation
- Aroma: Warm, Pungent, Peppery
- Extraction: Ajwain oil is extracted from the crushed seeds of ajwain by the method of steam distillation.
- Chemical composition: The main constituents of the ajwain oil are thymol, gamma-terpinene, p-cymene, and beta-pinene. Alpha-pinene, alpha-thujene, beta-myrcene, carvacrol, limonene, and terpinene-4-ol. There are variations in the composition of ajwain oils depending upon the region where it is cultivated. For instance, ajwain oil collected from Southern India is rich in thymol.

#### **Uses:**

- It is used for skin ailments. Ajwain can help with pimples.
- It is used as digestive aid. One can treat indigestion, ulcers, and various other bacterial infections of the gut with ajwain seeds and essential oil.
- It is Useful in aromatherapy, ajwain oil offers calming sensations that relieves neuralgia and migraines

### **CARDAMOM OIL (ELAICHI)**

- Botanical Name : Elettaria cardamomum
- Common Method Of Extraction : Steam Distillation
- Aroma : Very complex and smooth spice aroma
- Extraction: Cardamom oil is extracted using steam distillation method. For this, seeds of the fruit are used just before they ripe. The yield through this process is normally 1 to 5 per cent.
- Chemical Composition: Cardamom oil contains sabinene, myrcene, a-pinene, b-pinene, a-phellandrene, limonene, p-cymene, terpinolene, 1,8-cineole, gamma-terpinene, linalool, linalyl acetate, a-terpineol acetate, citronellol, nerol, terpinen-4-ol, a-terpineol, geraniol, methyl eugenol and trans-nerolidol.

#### **Uses:**

- Cardamom oil has a vast range of usage for treatment of sciatica, coughs, abdominal pains, spasm and nervous disorders.
- Traditionally, it is used for pulmonary disease, fever, digestive and urinary problems in India and China for over 3000 years.
- It is also used to flavour pharmaceutical products. Apart from pharmaceutical usage, cardamom oil is also used as a fragrant in soaps, perfumes and cosmetic products

## **ANISEED OIL(SAUNF)**

- Botanical Name: Pimpinella anisum
- Common Method of Extraction: Steam Distillation
- Aromatic Description: Distinctive scent of licorice. Rich and sweet.
- Color: Clear
- Constituents: a-pinene, camphene, B-pinene, linalool, cis-anethole, trans-anethole, safrole, anisaldehyde, acetoanisole.

### **Uses:**

- Its most common flavouring applications include being added to liqueurs, alcohol, gelatins, various candies, mints, chewing gum, and dairy products. Oil of aniseed is also reported to be used as an aromatic carminative to relieve flatulence, and as an ingredient of cough lozenges in combination with liquorice.
- To add a richer and more robust scent, Aniseed Essential Oil is also often added to cosmetic products such as shampoos, conditioners, creams, soaps, and perfumes.
- Aniseed essential oil has aromatherapeutic benefits associated with relieving asthma, colds or sinus symptoms, as well as quelling nausea and vomiting.
- Aniseed essential oil contains anethol, which is an effective anti-viral component.
- Aniseed oil can be made into a liquid scent and is used for both hunting and fishing. It is put on fishing lures to attract fish.
- Anethole, the principal component of anise oil, is a precursor that can eventually produce 2,5-dimethoxybenzaldehyde which is can be used in the clandestine synthesis of psychedelic drugs such as 2C-B, 2C-I and DOB.

# ANISEED PLANT

- Aniseed, on steam distillation, yields an essential oil, known as `Oil of Aniseed`, which has now replaced the fruits for medicinal and flavoring purposes.
- Aniseed oil is a colorless or pale-yellow liquid having the characteristic odor and taste of the fruit. The yield of oil generally varies from 1.9 to 3.1 per cent. Higher values up to 6 per cent have been reported from Syrian aniseed. Crushing of fruits prior to distillation gives better yields of oil. The material should be distilled soon after the crushing to prevent any loss of oil due to evaporation. Aniseed oil is a highly refractive liquid, which solidifies on cooling. The congealing point depends much on the anethole content and is a valuable criterion for evaluating the oil. Exposure of the oil to air causes polymerization, and some oxidation also takes place with the formation of anisaldehyde and anisic acid.
- The chief constituent of aniseed oil is anethole, which is present to the extent of 80 to 90 per cent and is mainly responsible for the characteristic flavor of the oil. The oil also contains methyl chavicol, p-methoxyphenyl acetone, and small amount of terpenes and sulfur containing compounds of disagreeable odour.



## REQUIREMENTS

- Steam generator (Copper Vessel),
- Round bottom flask (500 ml),
- Conical flask,
- Condenser,
- Glass tubes,
- Iron stand,
- Sand bath,
- Separatory funnel,
- Tripod stands,
- Burners,
- Saunf(Aniseed) .
- Ajwain(Carom)
- Cardamom(Elaichi)
- Petroleum ether(60-80°C),



# PROCEDURE

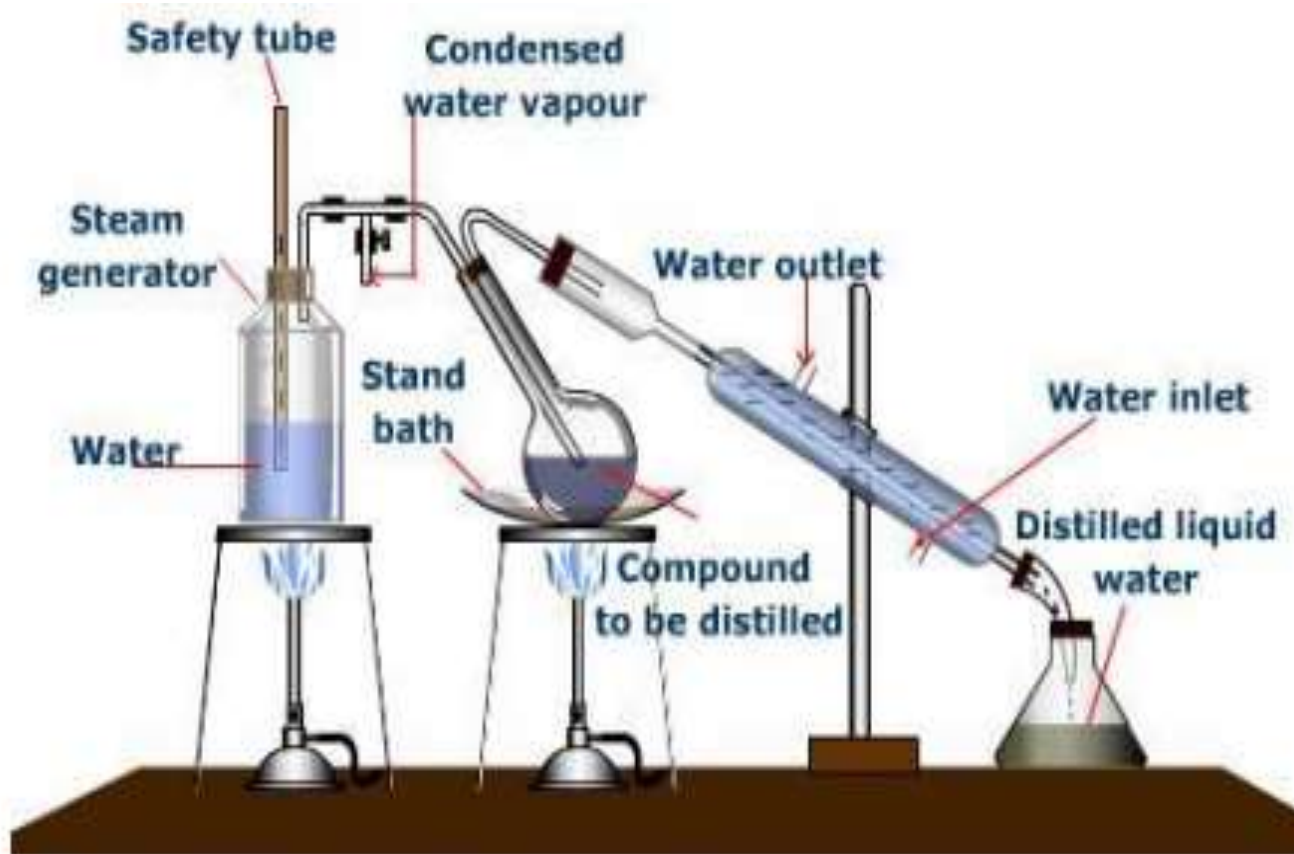
- Set the apparatus as shown in the picture of Experimental Setup.
- The apparatus consists of a steam generator connected to the round bottom flask through a glass inlet tube. The flask is connected to a water condenser through a glass outlet tube. Condenser is further attached to a receiver through an adaptor.
- Take about 750 ml of water in the steam generator and start heating to produce steam.
- In the round bottom flask take about 75 gm of crushed saunf.
- A vigorous current of steam from steam generator is passed through the round bottom flask.
- A part of the steam condenses in the round bottom flask. As more and more steam is passed, the steam volatile components of saunf pass through the condenser along with steam. These contents on condensation are collected in the receiver.
- The contents in the round bottom flask may be heated by a bunsen burner to prevent excessive condensation of steam.
- The process of steam distillation is continued for about half an hour.
- Transfer the distillate to a separating funnel and extract with 20 ml portions of petroleum ether 3 times.
- Combine the petroleum ether extracts in a 250 ml conical flask and dry it with the help of anhydrous sodium sulphate.
- Remove the solvent from the dried filtrate by careful distillation in a water bath.

The essential oil is left behind in the distillation flask.

- Find the weight of the extracted essential oil.
- Note the colour, odour and weight of the essential oil.



# EXPERIMENTAL SET UP



# OBSERVATION



## 1.) Saunf (Aniseed):-

- Weight of Saunf taken = 100 gm
- Initial Weight of the bottle = 10gm(x)
- Weight of bottle + essential oil = 11.25 gm(y)
- Weight of essential oil extracted = (y-x) = 1.25 gm
- Percentage of essential oil =  $(y/100)*100=1.25\%$
- Colour of the oil = Colourless
- Odour of the oil = Saunf like smell.



## 2.) Ajwain (Carom):-

- Weight of ajwain taken = 75 gm
- Initial Weight of the bottle = 10 gm(x)
- Weight of bottle + essential oil = 11 gm(y)
- Weight of essential oil extracted = (y-x) = 1 gm
- Percentage of essential oil =  $(y/75)*100=1.33\%$
- Colour of the oil = Colourless
- Odour of the oil = Ajwain like smell.



## 3) Cardamom(Elaichi):-

- Weight of elaichi taken = 100 gm
- Initial Weight of the bottle = 10 gm(x)
- Weight of bottle + essential oil = 11.25gm(y)
- Weight of essential oil extracted = (y-x) = 1.25 gm
- Percentage of essential oil =  $(y/100)*100=1.25\%$
- Colour of the oil = Colourless
- Odour of the oil = elaichi like smell.

# RESULT

Essential oils present in aniseed, carom and cardamom are extracted from **Steam distillation** method.

## CONCLUSION

- Essential oils smell great, reduce stress, treat fungal infections, and help you sleep. They are concentrated extractions from plants. A process called distillation turns the “essence” of a plant into a liquefied form for many medicinal and recreational uses.
- Essential oils have many uses outside of aromatherapy. Many people use them to scent their homes or freshen up things like laundry. They are also used as a natural scent in homemade cosmetics and high-quality natural products
- Essential oils enter the body primarily in three ways—applied to the skin, inhaled, or ingested. Within each of these, there are many different kinds of application methods. For example, you can apply essential oils topically using compresses, sprays, baths, or massaging them into the skin.
- Other most Essential Oils are
  - Lavender (*Lavandula officinalis*)
  - Rosemary (*Rosmarinus officinalis*)
  - Tea Tree (*Melaleuca alternifolia*)
  - Lemon (*Citrus limonum*)
  - Peppermint (*Mentha piperita*)
  - Eucalyptus (*Eucalyptus globulus*, *Eucalyptus sideroxylon* and *Eucalyptus torquata*)
  - Clove (*Syzygium aromaticum*)
  - Chamomile (*Anthemis nobilis*)
  - Frankincense (*Boswellia carterii*)
  - Myrrh (*Commiphora myrrha*)
  - Grapefruit (*Citrus paradisi*)
  - Oregano (*Origanum vulgare*)
  - Ginger (*Zingiber officinale*)

Essential oil is also used externally as an insecticide against small insects such as head lice, mites and vermin. It also has fungicidal properties.

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thank  
you