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# Essential Oil: Production for Health Care in Current Scenario

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## ABSTRACT

*Essential oils are complex mixtures of many natural components contains volatile aroma compounds extracts from fragrant plants. It can be extracted from different part of the plant, like leaves, grasses, flowers, wood and shrubs. The chemical properties of these aromatic substances may be due to different chemical compounds. These have medicinal, therapeutic and antimicrobial properties. Essential oil has been obtained from plant by the distillation technique at ancient time. But due to less amount of essential oil present in aromatic medicinal plant. Steam distillation, solvent extraction and supercritical fluid extraction are used to extraction of essential oil for better oil recovery. Oil percent can be evaluated by gas liquid chromatography (GLC) and molecular structures identified by gas liquid mass spectroscopy (GC-MS). The qualities of essential oil depend on both the cultivation of the herbs and extraction process of oils from the plants. Natural compounds are source of safer or more effective substitutes for artificial pesticides and also provide an alternative way to prevent cure diseases. Large scale productions of aromatic plants are good source of earning of farmers. It can be play important role for the growth and economy of the country.*

**Key words:** Antimicrobial activity, Distillation, SFE, Terpenoids and Fragrance.

## INTRODUCTION

In India, out of the total medicinal raw material, 90% is collected from the forests that are controlled by government. The proper utilization of medicinal plant resources requires a comprehensive approach. There are various issues that are relevant to this area of activity. This includes quantitative and taking economic valuation, standardization in terms of therapeutic and

augmentation of resources through conservation, domestication and large scale cultivation. There is an imperative need for retrieval and documentation of this information at national level, developing appropriate technology and creating conducive conditions for gainful utilization of available and already developed resources. Developed countries have vast potential in cultivating the herbs due to their climate, rainfall and geographical conditions. The economics of essential oil production depend on both the cultivation of the herbs and extraction of oils from the herbs. Oil has a well-deserved reputation in aromatherapy, with its deep, musky, sweet odor and earth and fire balancing energy. Aromatherapy is based on the realization that it makes man healthy and strong and that he can stay as such as living in accordance with the laws of nature. It is an exotic aroma that can forever leave an imprint on the olfactory memory. Their use in pharmacy is due to the physiological effect of a single component of the essential oil, or a group of components. This needs a holistic approach at the nation level. Promotional as well as commercial schemes have to be launched in world level. The 15 agro-climatic zones, which have been further divided into 24 agro-ecological zones for finer segregation of the complex biodiversity, have been instrumental in making India one of the largest repositories of herbal wealth in the world. Indian government also provides subsidy for the production of medicinal plants. Preparation of drugs from natural sources has been an intensely skill and labor intensive cottage industry that employment to a large number of people. Medicinal and aromatic plants can be cultivated even in the low rainfall, rain-fed areas where food grain production is normally un-remunerative due to high cost of irrigation. It becomes more relevant as most of the rural poor are dependent on such land. It can be an effective tool in poverty alleviation efforts. Medicinal and aromatic crops are ideal to be cultivated in the newly developed watersheds where water use has to be most economical.

***Essential oil***

Essential oil is concentrated, hydrophobic liquid containing volatile aroma compounds extracts from fragrant plants. Essential oil is produced on secondary metabolism of plants. The chemical nature of these aromatic substances may be due to a variety of the complex the chemical compounds. Essential oils are mainly composed of monoterpenes, sesquiterpenes and other derivatives [32]. Essential oils are odoriferous bodies of an oily nature obtained from herbal sources liquid at ordinary temperatures and volatile without decomposition. In some plant species one main constituent of the oil may predominate.

In many plant species no single compound predominates and rather there is a balance of various components. Charaka and Susruta gave a detailed description of the plants, their properties and positive effect on all the major physical systems of the body including the circulatory, lymphatic, eliminative, reproductive, endocrine, muscular and skeletal. The effect of essential oils on the mental and emotions is extraordinary, uplifting depression, anxiety into clarity and stress into calming.

Essential oils are known to be sedative or stimulating in nature, addressing the autonomic nervous system to produce the desired effect. Each essential oil has its own unique medicinal qualities, characteristics and therapeutic effects. It can be used as a mode of treatment for different ailments and it can restore many patients to health and vigor.

**Table -1: Medicinal Properties of Essential Oil**

| Essential oil | Properties | References |
|---|---|---|
| Ageratum oil (asteraceae) | Skin disease, wound healing, anti-asthmatic | [16] |
| Basil oil (Labiatae) | Antibacterial, insecticidal, stimulant, stomachic and diaphoretic | [28] |
| Camphor oil (Lauraceae) | Rubefacient, tooth powder and cosmetic agent. | [2] |
| Chamomile oil (compositae) | antiseptic and anti-inflammatory | [26] |
| Citronella oil (Gramineae) | Perfumery, mosquito repellent and flavoring agent. | [30] |
| Clove oil (Myrtaceae) | Dental analgesic, carminative, stimulant and antiseptic. | [5] |
| Eucalyptus oil (Myrtaceae) | Counter-irritant, antiseptic, expectorant, cough reliever | [3] |
| Geranium oil (Geraniaceae) | Flavoring agent, anticancerous and stimulant. | [9] |
| Lavender oil (labiatae) | antiseptic , anti-inflammatory, prevents infection, promotes rapid healing | [1] |
| Lemongrass oil (Graminae) | Flavoring agent, antiseptic and deodorant | [31] |
| Ocimum sanctum oil | anti-inflammatory activity | [10] |
| Orange oil (Rutaceae) | Stomachic, carminative and flavoring agent. | [25] |
| Palmarosa oil (Graminae) | Cosmetic, anti rheumatism and insect repellent | [11] |
| Patchouli Oil (Labiatae) | Insect repellent, diuretic properties and anti rheumatism | [47] |
| Peppermint oil (Labiatae) | Digestent, stimulant and tonic | [46] |
| Sandalwood (santalaceae) | Skin care, antiseptic and anti-inflammatory properties | [14] |
| *Tagetes minuta* oil (compositae) | Insect repellent, hypotensive, spasmolytic & anti-inflammatory | [36] |
| Thyme oil (Labiatae) | antitussive, anthelmintic, antispasmodic, carminative and diuretic | [15] |
| Vetiver oil (Graminae) | Antioxidant, Stimulant, refrigerant, flavoring agent, stomachic and fixative | [20] |

***Extraction processes of Essential Oils***

At ancient time, essential oils are normally extracted by distillation, steam distillation or organic solvent extraction techniques. Distillation is a method of separating chemical substances based on differences in their volatilities in a boiling liquid mixture. In distillation process plant materials are dried for 3-4 hours in sunlight after that plant material placed in Clevenger with solvent. It can burn by heater and volatile substance extracted with vapor.

The plant material near the bottom walls of the still comes in direct contact with the fire from Clevenger; there is a likelihood of its getting charred and thus imparting an objectionable odor (burning note) to the essential oil.

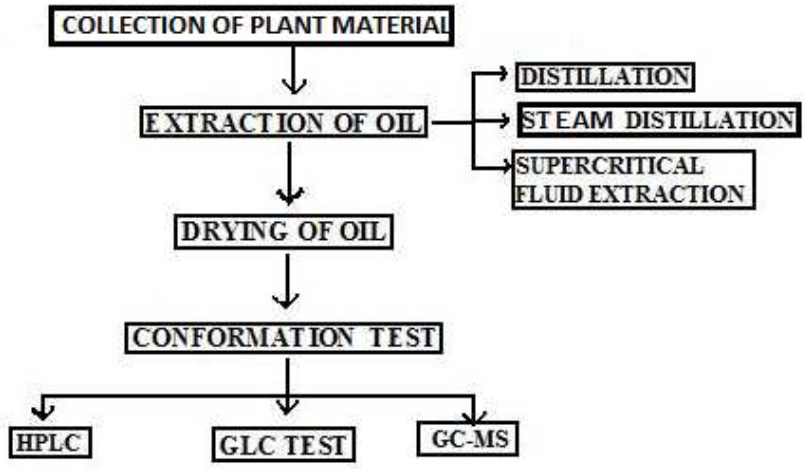


**Figure. 1: Extraction and Identification of Compounds in Essential Oil**

In steam distillation process, steam is generated separately in a steam boiler and is passed through the distillation tank through a steam coil [7]. The plant material is tightly packed above the perforated grid (net). Steam along with oil vapors is condensed in the condenser and is separated in the oil receiver. Capital cost of putting up steam distillation unit is higher and also a trained person is required for operation of the boiler. Long extraction time, low yield, toxic solvent residue, labor-intensive operation and degradation of thermo-sensitive compounds are involved in using such techniques. Prolong action of hot water can cause hydrolysis of some constituents of the essential oils such as ester, etc. The process is slow and the distillation time is much longer thereby consuming more fuel. These disadvantages can be avoided by using the supercritical fluid extraction (SFE) process. SFE is a rapidly developing method to produce bioactive compounds by pure technology, under mild conditions [44].

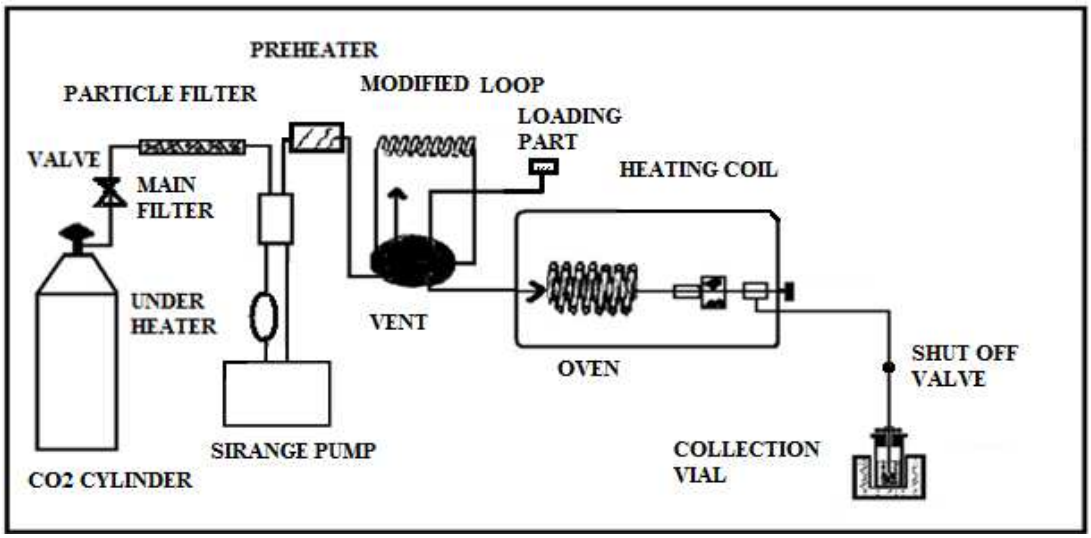


**Figure. 2: Supercritical Fluid Extraction**

Therefore Supercritical Fluid Extraction (SFE) has no risk of solvent contamination and chemical modification, problems, which may occur in conventional extraction technique [34]. The unique characteristic of this system is usage of gases mainly Carbon dioxide ($CO_2$) above their critical point to extract selective soluble natural components from a raw material [8, 40]. A great deal of study has been done to use supercritical fluid extraction (SFE) with carbon dioxide ($CO_2$) as a solvent for extraction of natural compounds from different raw materials. Carbon dioxide has the major advantages like chemically inert, low toxicity, physiologically harmless, environmentally safe, non-explosive, readily available and it can be easily removed from products [43].

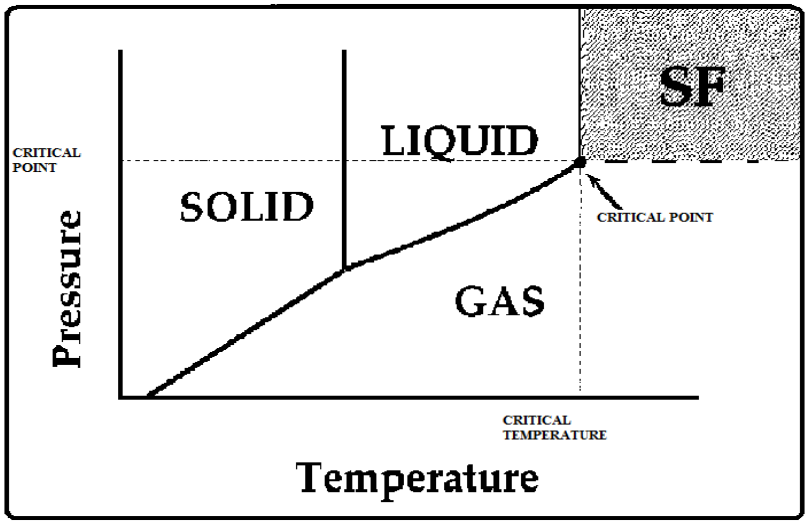


**Figure. 3: Temperature-Pressure Phase Diagram for Oil**

Supercritical fluid extraction may be compared with conventional steam distillation and to Soxhlet extraction by solvent [38]. Now a days, the application of supercritical fluid extraction (SFE) includes the industries of food, biotech, pharmacy and environmental engineering [22]. The presence of by product like alcohol, terpenes, aldehydes and phenols in the condensed water (hydrolate) may be used as the main product of other industry [19].

***Quality Control of Oil***

There are so many techniques use for quality control of essential oil. The main steps involved in control of essential oil contain size reduction, sieving, column chromatography, spray drying, standardization and crystallization. It seems to be reacting by heat, by the presence of air (oxygen) or moisture, catalyzed by exposure to light or by metals. For removal of these drawback Each essential oil firstly remove metallic impurities, dry from moisture and clarified and then it can be stored in well-filled, tightly closed containers, at low temperature and protected from light. The oil can be dehydrated quite readily by the addition of anhydrous sodium sulphate, by thoroughly shaking, standing for overnight or 6-8 hours and filtration. Each oil of a compound or group of compounds has unique medicinal or specific property. They are also used as fragrance and flavoring compound in food, pan masala or synthetic juices [35, 37]. So it is necessary requirement to control the quality of product. The percentage of these constituents in the oil plays an important part in determining its quality. The quality and price of some oils are based on the percentage content of a single chemical component, so separation and measurement of individual components is very important. Analytical analysis has been widely done by gas chromatography (GC) and mass spectroscopy (MS). The apparatus by which the fractions and their percentage are determined is Gas Liquid Chromatographic unit (GLC). It is most widely used techniques. The analysis requires 1–5 g of plant essential oil in 80-90 minutes, including distillation and GC [41].

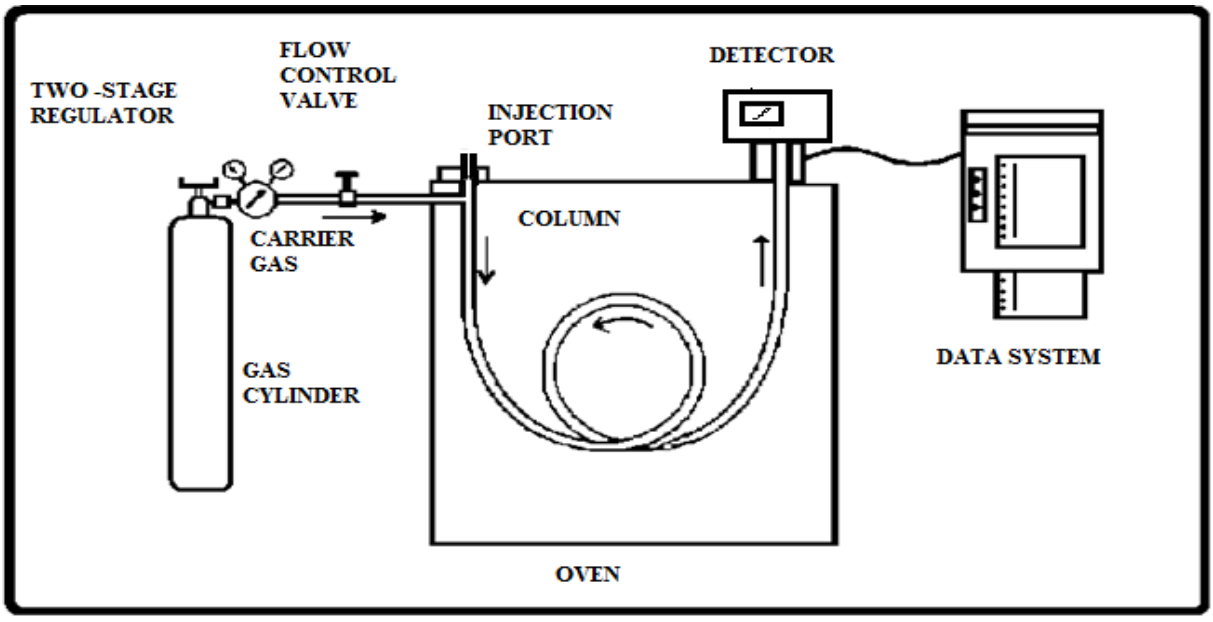


**Figure. 4: GLC System for product detection**

For food or medicinal extracts TLC (Thin Layer Chromatography), HPLC (High Pressure Liquid Chromatography) and HPTLC (High Pressure Thin Layer Chromatography) techniques are being used. Identification of compounds employs a form of spectroscopy (mass, UV, IR, NMR) to indicate the molecular structure. Some property of compound like optical rotation, enantiomer, specific gravity and polarization are also play important role for the identification of compounds.

***Storage of Oil***

If the oil is in small quantity then they may be stored in bottles of hard and dark brown color bottle and larger quantities of essential oil kept in stainless steel or aluminum containers. During storage oil should be filled up to the brim and containers should be kept in shaded and cool places away from sunlight. A layer of carbon dioxide or nitrogen gas blown into container before its seal replace by layer of air above the oil and therefore assure added protection against oxidation.

***Uses of Essential Oil***

Essential oils have been used since the ancient time. They are used in perfumes, cosmetics for flavoring food and drink, for scenting incense and cleaning products [33]. It is also used in aromatherapy as prolong time. Aromatherapy is a constructive method of treatment which aims at removing the basic cause of disease through the rational use of the essential oils. It uses of essential oil in body & skin care treatments. Aromatherapy diffusers are utilized to fill the massage room with the scent of the oils. When one is dealing with hundreds and now-a-days thousands of raw materials of widely different characterizing odors, intensities, chemical and physical properties. The general massage, dealing with all external organ of the body, is most useful in different ways. It tones up the nervous system, influences respiration and quickens the elimination of poisons and waste material from the body through the various eliminative organs such as the lungs, skin and kidneys. It also boosts blood circulation and metabolism of the body. A massage can removes facial wrinkles, helps to fill out hollow cheeks and neck and eases stiffness, sore muscles and numbness. It is essential to have some means of classifying to facilitate selection, comparison and arrangement and finally the blending. Their classification may be due to its volatility or to the similarity of odor group Specific essential oils are blended and added to carrier oil, such as almond oil, to be used in the massage.

Each oil has its own unique healing properties. This massage is an art which operates through the empathy between the person doing massage and the person receiving it & the aroma of the oils. Essential oils can be added to the bath or massaged into the skin, inhaled directly or diffused to scent an entire room. They are absorbed into the skin and work within the body in the same way as traditional medicines. If essential oils applied to the skin, then their lipophilic fraction reacting with the lipid parts of the cell membranes and modify the activity of the calcium ion channels. When inhaled, it works on the brain and nervous system through stimulation of the olfactory nerves. Essential oil acts on insects through their aroma compounds which are highly volatile and biodegradable. Their potential for bioaccumulation and persistence are much lower, so it is used instead of chemical pesticides which have adverse effect on population and environment because of their high potential of bioaccumulation. Naturally occurring biologically active compounds from plants are examples of generally regarded as safe and natural compounds. These plant extracts are generally assumed to be more acceptable and less hazardous than

synthetic compounds. It means that essential oils that are registered food grade materials could be used as alternative anti-fungal and anti-bacterial treatments for fresh product [6, 23].

**Table-2: Antimicrobial Activity of Essential Oil**

| Essential oil | Anti-fungal and anti-microbial effects | References |
|---|---|---|
| Basil oil | *Botrytis fabae, Vigna unguiculata ,Callosobruchus maculates* | [17, 28] |
| camomile oil | *Streptococcus pyogenes, Streptococcus mutans, Streptococcus faecalis* | [27] |
| cinnamon oil | *Bursaphelenchus xylophilus, Botrytis cinerea, Listeria monocytongenes*. | [18] |
| clove oil | *Botrytis cinerea Prevotella intermedia, Prevotella melaninogenica, Pophyromonas gingivalis* and *Actinobacillus actinomycetemcomitans,* | [4] |
| eucalyptus oil | *Escherichia coli* and *S. aureus.* | [12] |
| *Ginger oil* | *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus subtilis*. | [29] |
| *Mentha Spicata oil* | *Aspergillus ochraceus, Penicillium digitatum ,Pyricularia oryzae, Alternaria alternate* | [45] |
| Ocimum gratissimum oil | Listeria monocytogenes | [21] |
| *Pistacia vera* | *S. aureus, E. coli , Proteus spp.* | [13] |
| Thyme oil | *Aspergillus flavus, Cladosporium cladosporioides, Penicillium ochrochloron, Staphylococcus aureus* | [15, 39] |
| *Xylopia aethiopica* oil | *Escherichia coli, Staphylococcus aureus , Aspergillus flavus* | [24] |

The potential for these types of aromatic plant extracts is considerable. Modern day research has confirmed their therapeutic and medicinal qualities of being Anti-viral, anti-venomous, anti-depressive, anti-neuralgic and diuretic in nature. Researcher found that essential oils from different aromatic plants with antibacterial or antifungal activity. The antimicrobial activity of essential oils is due to various small terpenoids and phenolic compounds (thymol, carvacrol, eugenol), which have high antibacterial activity. The essential oils and their components works against a wide variety of microorganisms, including Gram-negative, Gram-positive bacteria and fungi [42]. There is great demand for fungicides in the area of food protection, agriculture and medicinal syrup.

## CONCLUSION

Plants were used extensively for remedial purposes in ancient times as well as the middle ages. Essential oils are natural aromatic compound mixture. Oils have so many medicinal and antimicrobial properties, due to this production of medicinal and aromatic plants are most important for population. Some of essential oils used as a growth supplements for human and also show fungicides, anti-bacterial and antimicrobial properties in agriculture sector. There is no

side effect of essential oil when the known concentration is used. Bioaccumulation of these compounds is in very small quantity instead of chemically synthesized compound. Therefore production of aromatic plants, useful for pharmaceutical, food and perfume industries and for healthy economic condition for the country.

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